THE END OF THE WORLD ISSUE

21·C

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Madonna, Dracula and Sexuality

The Ecstasy of the Apocalypse

Derek Denton

Talking to the animals

Tom Forester

Software Samurai

Ecodesign

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ABC

THE MAGAZINE OF THE AUSTRALIAN COMMISSION FOR THE FUTURE

SUPPORTING EDUCATION

Telecom Australia is supporting the Australian Commission for the Future in sponsoring *21•C* into secondary schools throughout Australia.

This issue of *21•C* will be delivered free to all secondary schools in Queensland. Past issues have gone into secondary schools in New South Wales, Victoria and South Australia.

Like the Commission, Telecom Australia recognises the need for ongoing promotion of greater awareness about science and technology among children if we are to fulfil our future as a 'clever country'.

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BUILDING THE FUTURE

MESSAGE FROM THE CHAIRMAN OF THE AUSTRALIAN COMMISSION FOR THE FUTURE

We know – as many teachers know – just how good *21•C* is, and how valuable it is for classwork.

Now the Australian Commission for the Future, with the support of Telecom Australia, is able to place a free copy of this issue of *21•C* in every government school in Queensland.

I hope you join our growing number of supporters.

Robyn Williams.

A Living Choice

Susan Oliver
Managing Director, The Australian Commission for the Future.

Five years ago Australia was content with business-as-usual. Historically this *laissez-faire* attitude automatically yielded many of the economic and social benefits of the modern world; employment, the latest technology, increasing prosperity, political stability and reassurance about our place in the world of the past, the present and the future.

Australia believed that the rural sector – through its highs and lows – was there for keeps; that Australia's role in the Asia Pacific region was there for the asking; that Australia could continue to offer jobs and exciting careers to the young. We believed that pollution and the impacts of poor environmental management – along with the nuclear threat – were problems for the other side of the globe; that real estate was an ever appreciating asset; that any Australian who worked and saved would secure a comfortable retirement.

Many of these myths have now exploded, and Australia has been forced to the uncomfortable realisation that it may even find itself singled out for some of the really bad news. Australia is especially at risk when it comes to such problems as the hole in the ozone layer. Similarly, Australia's record in land and water degradation is among the worst in the world. Economically and socially our level of unemployment spells disaster and neither of the major political parties are offering any realistic solution in the medium-term future.

The realisation that the future is not assured is unsettling. Combined with media presentations of the potential for human disaster due to poor environmental management and inequitable economic distribution world-wide, and such recent examples as the shocking environmental disasters in eastern Europe, drought, famine and war in Somalia, flooding in Bangladesh, outbreak of violence in the streets of Los Angeles – it is little wonder that our minds have turned to seeking out solutions.

Written to coincide with the Rio de Janeiro Earth Summit in 1992, the Club of Rome's book *Beyond the Limits* confirms the dire predictions presented under a business-as-usual scenario, but it also offers a number of solutions. The summary which updates the earlier work, *Limits to Growth* (1973) states:

- "Human use of many essential resources and generation of many kinds of pollutants have already surpassed rates that are physically sustainable. Without significant reductions in material and energy flows, there will be in the coming decades an uncontrolled decline in per capita food output, energy use, and industrial production."
- "This decline is not inevitable. To avoid it two changes are necessary. The first is a comprehensive revision of policies and practices that perpetuate growth in material consumption and in population. The second is a rapid, drastic increase in the efficiency with which materials and energy are used."
- "A sustainable society is still technically and economically possible. It could be much more desirable than a society that tries to solve its problems by constant expansion. The transition to a sustainable society requires a careful balance between long-term and short-term goals and an emphasis on sufficiency, equity, and quality of life rather than on quality of output. It requires more than productivity and more than technology; it also requires maturity, compassion, and wisdom."

Society must face the fact that, far from being the inevitable outcome of the conduct of business-as-usual, the future is ours to plan. In this scenario the role of futures organisations take on new value.

Since the late 1970s, full employment has ceased to be an objective of government. There is little evidence of a comprehensive industry policy under either party. The benefits of Australian investment in research and development are loosely connected – if connected at all – to an end benefit to Australians – as Fred Jevons says in his award winning UNESCO articles on capturing benefits from science and technology. This is also true of the benefits from development of our mineral resources.

In other words we do not have high employment nor do we have an objective of high – let alone full – employment. We do not have a robust and successful manufacturing sector nor do we have a vision of what that is for Australia and therefore a plan of how it can be achieved. When allocating funds to research and development we do not have in mind an expected outcome in terms of benefits to Australia. While the size of trade in mineral resources is huge and definitely finite, the wealth creation benefits to the recent generation and future generations of Australians is not captured as well as they have a right to expect, and nor is there a linkage drawn between resources and industry policies in order to deepen Australian industry expertise around naturally occurring competitive advantages.

This brings me to the matter of building a vision for the future. The Business Council of Australia is building *a vision for the future of business*, the Council for Economic Development of Australia (CEDA) is developing *a vision for Australia's economic future* and the Australian Manufacturing Council is developing *a vision for the future of manufacturing*. It is valid that these visions represent the specialised objectives of the groups building them, after all a vision needs to be implemented by someone and best of all if the group building the vision can take the responsibility to implement it. However, Australia needs to have a vision for its future which encompasses the full range of issues which constitute human satisfaction, quality of life and responsibility for future generations. As the Australian Commission for the Future believes; "First we have to imagine a better future, then we can build towards it."

A vision needs to be implemented by someone and best of all if the group building the vision can take the responsibility to implement it.

Gaining a Competitive Position in the World of the Future

As Australian companies become more focused on achieving international competitiveness, the processes used to develop corporate strategies are becoming leaner, more flexible and less centralised.

Public sector organisations are also under pressure to become more market oriented, and in many cases are being privatised, and are seeking to change their planning systems. These changes are being highlighted in a study being undertaken by the Commission into strategic planning practices in Australia.

The moves towards 'strategically managed' organisations where strategic decision making is made by line managers rather than by staff planning specialists, has led in many companies to cutbacks in the centralised 'planning' function. In addition to this trend, the Commission is receiving an increasing number of requests for information on and assistance with corporate vision and emerging issues workshops as the start of corporate strategic planning.

A wide range of organisations in both the public and private sector are recognising that these internal workshops, often with the external facilitation the Commission provides, can be highly effective in ensuring that a strategic review gets off to a good start.

The workshops ensure that all managers responsible for inputing to strategy development discuss and evolve a shared view of the external environment facing their organisation.

Depending on the time available for the corporate vision setting and strategic planning, the process may start with a one-day workshop which seeks simply to establish an agreed view of the external environment and the critical issues facing the organisation.

The intention of the workshop is to stimulate a wider-ranging review of the external environment and on a timeframe which is longer, often five to 20 years, than the organisation's usual strategy development. This allows the organisation to review opportunities and threats in the wider environment than might be considered in the more normal 'incremental' style of strategic planning, which may have a three year timeframe.

Increasingly the findings from these internal workshops are used to develop a range of scenarios of plausible but distinctly different futures which are used to break 'steady-as-she-goes' incremental organisational thinking. These scenarios are developed after researching trends in the driving forces acting on the organisation and its markets, and the agreed critical issues emerging from the workshop.

Where they are used to assist in developing corporate definition or vision and organisational purpose, the scenarios may be quite broad, although when used in other parts of the strategy process they may be very detailed.

Shell International is one large company which uses scenarios in its strategic planning process, and about every three years spends millions of dollars developing a new set of two opposing but plausible scenarios.

For many organisations a less intensive approach may be appropriate, and often the scenarios may be initially developed as part of an internal workshops by teams of participants, with the aim of breaking away from the traditional corporate view of the external world.

In either case, the scenarios will look at broad social, political, economic, environmental and technological trends but will be tailored to be specifically relevant to the organisation and its current and potential markets.

The trend observed by the Commission underlines that more organisations, including the public sector, are focusing increasingly on the customer and the external environment.

And the techniques being used in organisations with good strategic management are increasingly using combinations of traditional strategic planning and futures methodology. These may include scenario building, search conferences using outside experts, trend monitoring and analysis and a range of group interaction techniques.

These moves towards improved and flexible strategy development, and the adoption of new methods, augurs well for Australia's continued drive for improved international competitiveness and economic growth.

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COVER: Madonna, illustration by Piers Buxton.

LETTERS

Faking IT further

I thought you might like to know (re: Censorship and IT, Summer 1992) that virtual reality is already being used in sex therapy. I believe it is called 'dildonics' although it is used for both sexes.

There is a Chinese doctor in Singapore who is using a machine to cure impotence and lengthen penises. It did not look like a virtual reality machine from the photographs but if I can find out more, I'll let you know.

Something I did not say in our interview, but occurred to me as I read your piece: the human sexual response should be hard-wired but the process allows for variations and mistakes (chromosomes, genes, enzymes, hormones, target organs, transmitters and receptors). In addition, people are programmed (religion, socialisation) and self-program (life experience). This occurs very early. Change in adult life is mainly by way of evolution from an earlier foundation e.g. a man who likes little girls teaches himself to like photographs of little girls.

This means that it would become more difficult for people to learn to get turned on by electronic media as the media imposed more learning burdens between the foundations senses (sight, smell, touch, hearing) and human contact. Where the individual is a genuine adept (computer buff) or where the individual's arousal mechanism is attached to a highly conceptual mind, the medium might be less of an obstacle. (I am not only visually responsive: I react strongly to the statistical tables in the Kinsey Report.)

There is some evidence that, apart from the variability in visual arousal, the wiring in females is more stable and less variable than in males.

Discussion should be located in terms of existing knowledge about perception and behaviour. There is a risk of getting into virtual reality (Ooh! Ah!) and losing touch with reality.

BEATRICE FAUST
Victoria

Proactive poetics

Several items in the Summer 1992 issue of *21•C* prompt me to suggest that *21•C* take a proactive role in expanding the ways in which we use language to describe and make meaning of human experience.

Our history often precludes us from placing credence in other than rational argument as serious 'truth'. May I suggest the inclusion of narrative works in keeping with *21•C*'s themes to bring other perspective's to the ways in which we make sense of our world and think about the future? We had an article on J.G. Ballard (Autumn, 1992), highlighting the literary perspective, but can it be taken further to include prose and poetry items or excerpts? Ursula Le Guin springs to mind as an appropriate author to feature.

A further extension to enrich our understandings and deepen our insights would be the inclusion of a greater variety of visual works of art. The techno-montages illustrating articles are great, but images as discrete entities may be 'worth a thousand words'.

If people are serious about a more holistic world view and science with a soul, there is a need to start talking about reality in more than rationally reasoned ways. It is a challenge that I hope the editors of *21•C* and all futurists will respond to.

S.E. BURKE
QLD

Building the future

Recently I was introduced to your magazine *21•C* and I must say I was very impressed. For the past three years I have been abroad and was unaware of its existence. The magazine articles are very informative and enlightening, opening my eyes to many contemporary issues and how they affect the future of Australia and the world. It has certainly brought to my attention the Australian Commission for the Future. I would like to know more about the Commission and what role it is playing. Being an Architectural graduate I particularly enjoyed the articles on the MFP Australia Project and Urban Density (Roland Fletcher) in the Summer issue, hopefully in future issues there will be more articles on urban design issues and possibly the architectural and building sciences. As an architect I am, of course, concerned about the future of our cities and the way we will inhabit them not only in Australia, but globally. Keep up the good work with *21•C*, it is an important and valuable source of information and platform for debate.

MARK CASHMAN
NSW

The divide we deserve

I have just re-read the 'The Great Divide' (*21•C* Winter 1992) article following the inauguration of US President Bill Clinton and found the comments made there-in very interesting especially when read in connection with another article in the same edition, 'The Leaders We Deserve'. I have given much thought to the plight of our unemployed in Australia and the still worse situation that many million inhabitants of this planet find themselves in elsewhere.

The continual shift in the Western world to individualism and competition makes me apprehensive for my own children's future as I am trying to teach them to respect others and help those less fortunate than themselves. It will become impossible if the circumstances are such that if the person they might help can only continue to survive by then in turn robbing the next individual to come along; all in the name of competition!

I really enjoy reading *21•C* and I am far from being a 'techno-head'. However I always find the articles stimulating and thought provoking. Could I suggest some approach be made to the ACTU for an article on the changing role for Trade Unions in this brave new world of technological change and social upheaval. Being a strong trade unionist myself, this might be interesting.

CLINTON HANNEY
NSW

For the record

I was delighted about the 'Gaijin Futurist' piece (Summer, 1992), and the interesting photomontage. It has delighted everyone who has seen it too. It filled me with something I seldom have: nostalgia, since it reminded me of the good old '60s. I thought maybe I was looking at a portion of the cover of *Sgt. Pepper's Lonely Heart's Club Band*. I loved it! And thank you all for the care that went into it (and into *21•C* generally, which is a very high quality publication – I hope it is selling well).

JIM DATOR
Hawaii

Letters to the Editor should be addressed to The Editor, *21•C*, PO Box 115 Carlton South 3053. Due to limitations of space, letters over 250 words will be edited.

TAFE'S TURN

"I would argue that the greatest task facing Australia is recognising that the most important commodity in the 21st century will be knowledge, and the most important capability will be that of accessing, creating and using knowledge. Having and using knowledge will determine how well nations adapt, survive and prosper in a global environment characterised by accelerating change and increasing uncertainty – economically, environmentally, socially."
Simon Crean *21•C*, AUTUMN 1991, p.23.

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Issues surrounding leadership and the quality of our governance are among the most critical facing us in Australia and in the world generally. All organisations face the same problem – integration with a fast changing environment.
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EDITORIAL

This is my last edition as editor of *21•C*. Editing such a magazine has been a terrifying pleasure – how does one report on the future? What are the key issues that will impact on our children? How do we sustain the planet and cope with technological revolution? What does nanotechnology mean?

When the Australian Commission for the Future was established in 1985, among its objectives was to raise levels of community understanding about issues and empower people, both individually and collectively, to make appropriate decisions for themselves.

21•C was established in Summer 1990 as part of this bid. I took over the editorship as of the fourth edition (Summer '91) and was immediately confronted with the simple fact that there is no clear cut and simple future; that issues as varying as artificial intelligence and sewerage treatment are equally relevant.

The magazine's content has developed to express the varied issues the human race faces. We have sought out the most influential and authoritative figures and asked them to share their thoughts on the direction of the planet.

Some highlights of editing six editions of this magazine have to include McKenzie Wark's Technofear (#4), interviewing Peter Wilenski on the future of the UN (#5), publishing Alastair Mant's essay on The Leaders We Deserve (#6) and investigating the Apocalypse (#9). Such profiles as J.G. Ballard, Germaine Greer, Robert Jungk, Oliver Sacks, Derek Denton and Tom Forester have, I hope, given an insight into some of the more influential minds of our times. The blend of science, technology, environment, futures research and cultural issues has, I believe, given a satisfying quarterly package of information. Not quite a 'survival guide' for the future, but certainly food for thought.

Of course such a package could never have occurred without the support and enthusiasm of those involved in the magazine. I must give special thanks to Ray Edgar, Terence Hogan, Gib Wettenhall, Susan Oliver, Robyn Williams, Ken Buxton, Cherry Horan, Lois Buxton, Ian Robertson, Ken Wark, Wilson da Silva, Rick Slaughter, Paul Cogger, Joanne Cornwall and Emma McGivney.

Despite new commitments I plan to stay involved in *21•C*. I can't deny great regret in leaving the magazine at such an exciting phase in its life. Changes are imminent, but change, we find, is what makes the future exciting.

ASHLEY CRAWFORD
Editor

Ashley Crawford has accepted an exciting job offer editing a new contemporary arts magazine. The Australian Commission for the Future wishes him every success in this venture and congratulates him on his success with *21•C*. SUSAN OLIVER.

CONTENTS

SPACE RACES 8
The promise of Australia's space industry has left some people over the moon. Report by Wilson da Silva.

SCRAMJETS ARE GO! 12
Engineers with the right stuff by Paul Hendy.

SOUL MAN 14
Susan Oliver profiles the author who questions consciousness, Derek Denton.

NEXT 16
Peter Pockley on what's new in science and technology.

Grabbing the Tiger by the Tail 17
Australia's trade relations with Asia by Wilson da Silva, Barry Jones and John Spooner.

Limits to Girth 30
East eats West (and vice versa) by David Dale.

PLUGGING THE HOLE 32
Gib Wettenhall's investigation into the foundations and the falsehoods of the CFC debate.

SELLING THE PRESIDENT 36
McKenzie Wark on media manipulation and the character assassination of presidential candidates.

PRIME TIME PRIME MINISTER 41
Television: the drug of elections by Ray Edgar.

TECHNOMYSTICISM 42
John Potts exorcises the ghost in the machine.

THE ECSTASY OF ARMAGEDDON 48
Fundamentalists, heretics, survivalists and other wild visions of the end of the world by Ashley Crawford.

THE FUTURE OF THE APOCALYPSE 50
Revelling in, and revelations of, disaster by Damian Coleridge.

THE PERSECUTION OF THOUGHT 53
It doesn't pay to be too clever – you could get burnt at the stake. Ashley Crawford and Sandra Webster's inquisition.

DROPPING AN ETHICAL BOMB 56
Anna Clabburn probes the moral dilemmas of science.

IN DREAD WITH MADONNA 60
Catharine Lumby on gender conflict and the breakdown of traditional family structures.

IN YOUR FACE! 64
The interface: where computers and humans meet head on, by Jen St.Clair.

THE TOMES ARE A-CHANGIN' 68
Darryl Ribaux flicks through the electronic pages of tomorrow's books.

SOFTWARE CYNIC & HARDWARE HERETIC 72
Robyn Williams meets the hard hacking critic of information technology, Tom Forester.

TECHNOCOP 76
Fighting crime NASA-style. Jo Painter investigates. Simon Davies unveils surveillance in Australia.

DANGEROUS DREAMS 82
Should there be sci-fi after 19?, asks Damien Broderick.

RESHAPING DESIRE 86
From edible packaging to plastic cars by Chris Ryan.

THE TAO OF FUTURES 89
Rick Slaughter meets four of Asia's leading futurists.

MELBOURNE WATER

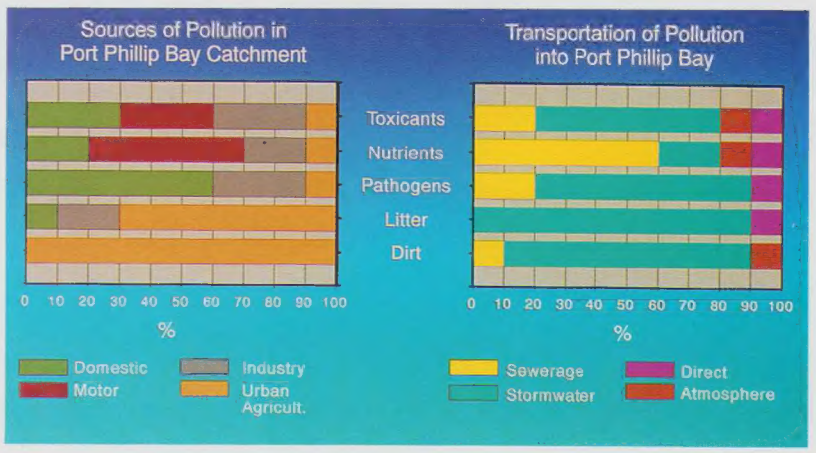
ICM

Leon C Collett
Manager,
Catchment Strategy
Division

Integrated Catchment Management (ICM) refers to the co-ordinated and balanced use of the natural resources within a water catchment to achieve environmental sustainability. These resources comprise land, water, vegetation and soils.

The concepts underpinning Integrated Catchment Management (ICM) have been around for some time. The approach was developed in the United States over 50 years ago. It has been used successfully in Europe, Canada, New Zealand and Great Britain where it is referred to as River Basin Management. In Australia, its lineage is more recent, having been championed here by Professor John Burton of the University of New England during the past 25 to 30 years. It is sometimes also referred to as Total Catchment Management. So what's behind these three words and why is Melbourne Water now picking up an "old thread"? ▲ It is now widely recognised that the activities conducted on the land have a direct impact on the quality of water. Our waterways and bays are showing the effects of pollution generated by people who live in the Port Phillip Bay and Western Port catchments and by the daily activities we carry out. Our urban areas are the major sources of pollution. ▲ Recognising changing community attitudes toward the environment and its broader environmental responsibilities, Melbourne Water recently regionalised its operations around the major catchment systems of Port Phillip Bay and Western Port. The three Regional groups are now busy preparing management plans based on catchments. Water will be a key theme of these plans, naturally enough, given Melbourne Water's major focus on water supply, sewerage and drainage services. However, Melbourne Water is also a major land manager particularly through its parks system. Melbourne Parks and Waterways, an enterprise of Melbourne Water, has the role of developing a Catchment Management Strategy for the organisation as a whole. ▲ The water industry in Australia has recognised for some time that ICM represents a practical way of implementing the principles of ecologically sustainable development. These principles have recently been endorsed jointly by the Commonwealth and all State Governments, in the Inter-Governmental Agreement on the Environment. Our governments have pledged to have their agencies use these principles, when making decisions on the management and use of natural resources. ▲ The essence of ICM was set out in a summary to the Proceedings of a National Workshop on ICM held in 1988. The summary notes that "Integrated catchment management is needed for a variety of reasons. First, land, water and environmental resources are interrelated. Activities on the land (for example, withdrawal of water for urban, industrial or agricultural use and disposal of municipal, industrial and agricultural wastes) can have significant implications for water quantity and quality. Conversely, many opportunities (for example, expansion of food production) and problems (for example, soil erosion) on the land are triggered by water. As a result, it is often not possible to resolve problems without considering water, land and environmental resources together, rather than focussing on each in isolation. ▲ An approach which explicitly recognises the interdependence of material and human systems is often described as an holistic or ecosystem perspective. Second, despite the interrelationships among various natural resources, public agencies traditionally have been created with mandates which focus them upon a specific resource. Thus, one agency is responsible for soil conservation, another for water, another for recreation and tourism, and yet another for energy. Each of these agencies frequently has a legitimate interest in land, water and environment problems. ▲ The resulting overlap of responsibilities, together with a lack of awareness of each agency's responsibilities, can result in the activities of one agency inadvertently undoing the work of another. ▲ Third, no matter how public agencies are structured, there will be some overlap of shared interests – creating what often are referred to as "edge" or boundary problems. A major issue is to determine how to plan, manage and develop natural resources in the context of such problems. Public agencies are not the only ones with a legitimate and valid interest in water, land and environmental resources. Private landholders, industrial firms and recreationists all have special interests in how resources are

Waste generation and transport



MELBOURNE
Parks & Waterways

An enterprise of the Melbourne Water Corporation

developed and regulated. These diverse and often opposing interests lead to conflicts and disputes. As a result, there is a need for a process to allow varied and multiple views from the private and the public sectors to be considered. Integrated catchment management is a process or tool which allows consideration of the natural linkages among natural resources, as well as consideration of diverse interests and values".

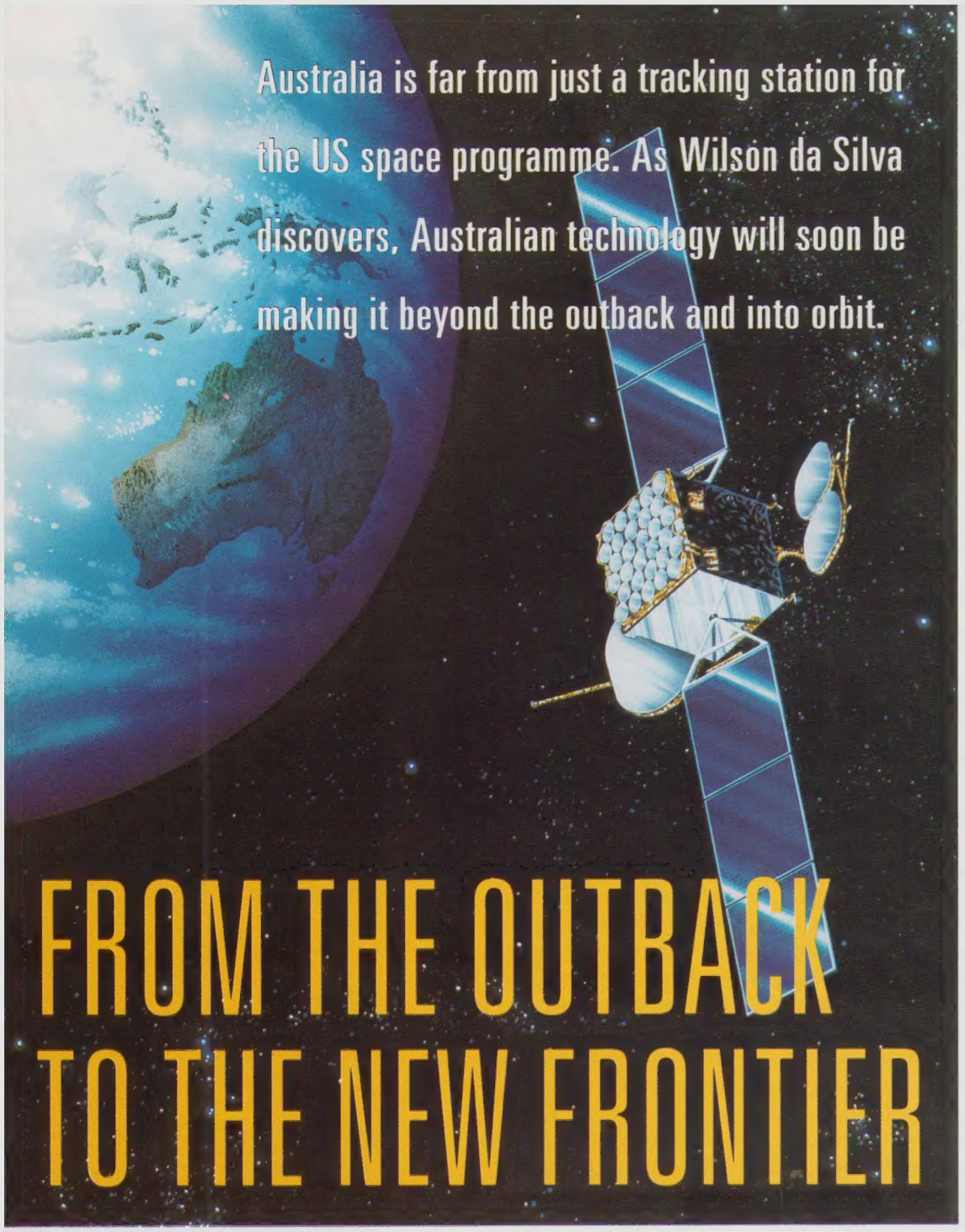
▲ In preparing management plans on a catchment basis, the Regional Offices of Melbourne Water will be focussing on the control of water pollution. ▲ City officials, as far back as Roman times, have known of the importance of good water supply and sanitation. Melbourne is fortunate that over 100 years ago, our pioneers recognised that a sewerage system, to deal with the wastes of the city, was a necessity. The pleasant Melbourne environs have developed and survive largely because over the past century the sewerage system has served the city with relatively little trouble.

▲ The work of preparing management plans has thrown up the lack of relevant information about Melbourne's catchments and the pollution generated within the suburbs, in our houses, backyards and on our streets. The things we use, household chemicals, fertilisers and pesticides in our gardens, paints, solvents, building materials and the wastes we generate, garbage, litter, animal faeces and the like all contribute to water pollution. By and large, the motor car is the most significant generator of pollutants of all: lead dust from petrol, nitrous oxides in the exhaust, brake and tyre dust, oil, petrol, diesel and engine detergents add to the long list of polluting materials associated with the use of the motor car. Melbourne Water has just completed a review of the activities in our catchments and the impact of pollutants generated by them on our waterways. The box diagrams on this page illustrate the preliminary findings on the sources and transport of pollutants. ▲ The study has identified a number of data gaps which will need to be filled, if resource management and pollution problems are to be tackled effectively in the management plans. ▲ It is not possible to prepare a successful catchment management plan, which will deal with pollution matters, in the absence of factual information. A research program has already commenced to provide the needed data. ▲ To assist in the understanding of how pollutants behave, Melbourne Water has teamed up with other participants in two Research programs being funded in part by the Federal Government, namely the Co-operative Research Centre on Freshwater Ecology and the Co-operative Research Centre on Catchment Hydrology. Both CRC's will be studying problems relating to Melbourne's catchments and waterways. ▲ As well, Melbourne Water has commissioned the CSIRO to manage a major environmental study of Port Phillip Bay, which will identify the loads of pollutants emanating from the catchments, which may impact on the Bay's ecological health. ▲ Melbourne Water has also embarked on a major litter control campaign with the assistance of a number of agencies and other organisations like Keep Australia Beautiful, Clean Up Australia and the Municipal Association of Victoria. The campaign aims to change community attitudes to littering and waste disposal, so that our waterways and beaches will continue to provide attractive environments for recreation and other uses. To date this campaign has mounted a successful TV advertisement, which shows how street litter finds its way through the street drainage system into our waterways and the Bay. A teachers' kit and a video based on the same theme was also produced and is available for sale to schools. With the assistance of the Plastics Industry Association a series of posters was placed around Melbourne advising "If you rubbish our streets you rubbish our rivers and the Bay".

In an innovative trial, items normally found in waterways and beach litter were tagged to trace their travel path and travel times through the drainage system, from the suburbs to various destinations. A large number of tagged items ended up on bayside beaches up to kilometres away from the sites where they were "launched". Rainfall events were shown to be a major factor in transporting litter through the drainage system. This study has highlighted the need for the placement of litter traps in drains and litter booms across waterways, to capture street litter on its way through the drainage system. Melbourne Water has developed a number of innovative litter trap designs for installation in drains and with the support of Local Government has successfully tested several designs in a pilot program. Work of this nature will be extended to further reduce the loads of litter reaching the waterways and Bay. Many school children have now participated in a program to increase school and community awareness of litter pathways via drains to the waterways and the Bay, through a stencilling program. Side entry pits (the hole in the gutter where the tennis ball disappears) are being given a slogan to help local residents recognise the links between streets, footpaths, backyards and the drainage system. The next few years will see a continued emphasis on litter control as part of the regional catchment management program.

▲ Catchment management may be an "old thread" but it offers exciting potential for two key reasons. Firstly, it provides the ideal opportunity for members of the community to actively participate in preparation and implementation of catchment plans affecting their local areas. Secondly, the development in computing hardware and modelling software during the last decade, will provide the means for participants in catchment management to be able to manipulate the huge quantities of information needed to understand the complex interactions which happen in urban catchments. Such power has never been available for this purpose before and has limited previous progress with ICM methods.

▲ Melbourne Water's move to ICM is a timely one, which will contribute to the long term sustainability of Melbourne's natural attractiveness.



The outback. Dusty red roads, shimmering salt flats and the dry, searing heat. It's only fitting that Australia's latest efforts to buy into the space business are to begin here, in the old Woomera rocket range where Australia will become only the third nation to put a satellite into space from its own soil with the launch of Wresat in 1967.

Thirty years after the locally-built Wresat, aboard a converted US Redstone missile, traced a fiery trail into the sky, Woomera may come alive again with the rumble of rocket motors catapulting payloads into space.

But unlike the 1950s and '60s when scientists and the military paid the bills, the '90s will be strictly a business affair.

Leading the commercialisation of local space talent is the Australian Space Office, established in 1986 with $5.25 million funding. From almost no space industry at all, it brought companies, engineers and scientists together and created a nexus of previously untapped and unco-ordinated skill that is now winning contracts internationally.

"There's a capability there that didn't exist five years ago, particularly in space-qualified hardware and systems," Dr Bruce Middleton, executive director of the office, told *21•C*. "There is a collaboration between companies which wasn't there, and a measure of experience in international space projects. Arising from that, there are now ambitions for much bigger projects."

In the six years since the office's inception, Australia has built hi-tech components for the European Space Agency's ERS-1 remote sensing satellite, established leading edge facilities that process and analyse images from space, developed an instrument capable of measuring heat differences in oceans from orbit, invented a purpose-built but inexpensive supercomputer to handle the huge volumes of satellite image data, become a manufacturing and decision-making partner in an international *Radioastron* project to conduct radio astronomy research from orbit, and flown an ultraviolet telescope aboard a US space shuttle. As part of their contractural work with Hughes Aircraft Corporation they have also built and designed a range of hardware components for both Optus satellites worth over $20 million. Ground stations in Australia, on contract to the US space agency NASA, have helped bring images from spacecraft like *Galileo*, *Magellan* and the twin *Voyagers* back to Earth and helped steer them on their way. Customers have also included Glavkosmos space agency of the former Soviet Union, Japan's National Space Development Agency and the 122-nation International Telecommunications Satellite Organisation, or Intelsat.

Today there are 18 Australian companies involved in manufacturing space hardware, ranging from Philips in Sydney to British Aerospace in Adelaide and Auspace in Canberra. There are also another six centres of research which have made or tested and designed space hardware, such as Canberra's Australian National University and the Defence Science and Technology Organisation in Adelaide.

Before the office was established, a 1985 study found Australian companies and governments had spent more than $500 million paying for imported space data and capabilities, some of which

could easily have been done locally, employing Australians and developing local industry in the process. It found that industry and government projections would see expenditure rise to between $375 and $500 million annually by 1995.

Over the past 20 years, other countries have done the sums and come to the same conclusions. Countries as disparate as Brazil, Sweden, Canada, Indonesia and Taiwan were all getting into the business, joining the billion-dollar club led by the United States, the then Soviet Union, China and Western Europe through the European Space Agency.

Now, slowly, some of the benefits are flowing back and Australia is becoming space smart. With the reactivation of Woomera, there are rumblings that it may even look like a contender for a berth in the forefront – a prospect unthinkable five years ago.

"We are not aiming to just build a space vehicle or operate a ground segment, it's a complete service we have in mind," says Ian Tuohy, chief scientist at British Aerospace's Australian subsidiary, one of the partners in the Woomera venture. "We are acutely aware of the very competitive marketplace that exists (in satellite launches) – but right now in the regime we're targeting, there is no operational commercial vehicle that is currently fully available."

The market in Tuohy's sights is that for lightsats, small and inexpensive satellites weighing up to 1,000 kg which can be dispatched into orbit cheaply to perform very specific functions. These include high-speed data links between a company's headquarters and a remote location, analysis of the resource or agricultural potential of a particular site, small production-line runs of valuable commercial products in space, environmental monitoring, flying test modules of orbital manufacturing facilities, task-specific science packages and – the grandaddy of them all – networks of low Earth orbit satellites allowing cellular telephones to operate anywhere in the world.

Many of these tasks can be handled by existing networks of big satellites, ponderous and expensive behemoths spinning 36,000 km above the Earth in a geosynchronous orbit that maintains them constantly over the same patch of ground. These beasts are so indispensable that their every working minute is laboriously scheduled months in advance.

What a lightsat allows is the flexibility of having a specific satellite for a specific task, available at a moment's notice – a very attractive option for some users. Just witness the explosive growth of

Below: the fast delivery processor developed by British Aerospace Australia for processing of synthetic aperture radar (SAR) imagery from the ERS-1 satellite. The Australian Centre for Remote Sensing (ACRES) is the first customer for the processor and an example of their use of the technology is the photo of Lake Frome, South Australia (right).

courier companies and fax machines – flexibility and rapid response, once it becomes available, can catch on. Lightsats also give poorer nations an entry into the benefits of the space business, which are still largely restricted to an elite club of industrialised nations.

Industry players have estimated that such a market will require up to 30 launches a year by 1996. Such a relatively untapped market has a huge potential, and the whiff of profits has the beancounters and engineers in smart suits mightily interested. British Aerospace Australia Ltd last August formed a consortium with Hawker de Havilland Ltd and Auspace Ltd to study the feasibility of operating such a service from Woomera, a rocket range 400 km northwest of Adelaide which has much of the infrastructure intact and – at double the size of Austria – big enough for expansion. The venture partners believe Woomera – with launch towers and control bunkers in near pristine condition, a dry and stable climate remote from population centres and with a tried-and-tested launch corridor – gives them a head start over likely competitors. On the record they downplay the project and stress its unproven market. But in private, you can hardly keep them moored to the ground.

It is the cellular telephone, once a yuppie accessory and now an everyday necessity for many, which will make small, low Earth orbit (LEO) satellites a high volume business. Some 200,000 cellular customers signed on each month in the United States in 1991, outstripping for the first time new fixed-line customers. The industry conservatively estimates that by decade's end there will be 100 million wireless telephone subscribers world-wide.

Asia is going to be a gold mine for telephone communications – with economies in the region growing at between five and 10 per cent annually

and only five telephones per 100 people in place, the potential market in the 1990s is enough to make even the most hard-nosed venture capitalist quiver. The communications business in Asia is already worth an estimated $US70 billion a year and tipped to double by the end of the century.

Last year Asia accounted for about 31 per cent of world communications equipment sales, and industry analysts forecast investment to grow 6.7 per cent a year for the rest of the decade. This compares with estimates of 4.4 per cent growth in Europe and 2.8 per cent in North America. Analysts estimate that 500 million new phones will be needed in the Asia-Pacific region in the next 20 years – more than the total number in the world today.

The ERS-1 spacecraft in launch configuration (arrays and antennae folded) in the test facilities at ESTEC, Noordwijk, Netherlands.

This explosion of demand is going to need an explosion of investment in space hardware, both in orbit and on the ground. One project alone, the Iridium satellite network being planned by Motorola Inc. of the United States, would be enough to justify the reactivation of the Woomera range. Iridium is a $US3.2 billion network of 66 LEO satellites straddling the globe, allowing cellular telephones to be used anywhere from 1998. The French have since detailed plans for

500 million new phones will be needed in the Asia-Pacific region in the next 20 years – more than the total number in the world today.

24 satellites to service a growing demand for high-speed data links between ships, trucks, trains and their offices. Both of these concepts, and the many that have been springing up in the past year, demand multiple satellite launches which existing services cannot provide. It is commercial, end-user demand like this that will drive the Woomera venture and propel Australia back into space.

Dubbed the Southern Launch Service, the consortium has started development of a new rocket using off-the-shelf technology. The consortium believes world demand for payloads weighing between 750 and 1500 kg will boom in the 1990s, and that it can charge between $US12 million and $US20 million for launches – a relative bargain. The venture, if it proceeds with the $20 million project, hopes to begin commercial launches in 1996 after two test launches with Australian government payloads in 1995.

"There is an emerging market there," says Middleton. "It may be a hard one to crack – they are not the only group gearing up to address that market. What we bring to it is the comparative advantage of Woomera, together with a small amount of experience and a capability among those companies." If industry estimates hold true, even a third of the world-wide business – say 10 launches a year – would create a $160 million a year export industry for Australia.

There are three main LEO payload competitors to the Woomera consortium likely to emerge in the next three years, all American: Orbital Sciences Corp and its innovative aircraft-launched Pegasus rocket and its Taurus launcher; EER System's more conventional but unproven and reputedly complex Conestoga rocket; and International Microspace's Orbital Express which aims to launch small payloads into polar orbits from Alaska. All are experiencing either financing or technical problems and may not get off the ground, although Orbital Sciences, with a turnover of $US185 million in 1992, is looking the healthiest with 22 firm orders to fly Pegasus and two firm orders to ride aboard Taurus.

Then there's Cape York. This proposal is so big it has even its most forceful proponents a little doubtful it can fly. Whereas Woomera is targeting the quick-launch, low-orbit, cheap rocket option, the two proposals for Cape York aim at the high end of town – the big communications satellites in geosynchronous orbit. There are very few players in this business: the Americans, the Russians and the Chinese. And as we saw with the failed launch of the Australian-owned Optus B2 satellite by China in December, launching these $100 million monsters can easily go wrong.

There are two competing consortia vying for Australian government approval to build a $1.2 billion commercial launch site in the remote Cape York Peninsula, where the proximity to the equator would give rockets an added boost, allowing to go further into space on less fuel. It could become one of Australia's most important industrial projects, earning $130 million a year in exports, adding $400 million to economic growth and creating 2,700 jobs.

While the Space Office has been working with Russia's space agency over the years it was partly a stroke of brilliance and partly luck, that saw it clinch a deal with the Russians to use their reliable and powerful Zenit rocket for launches, before the collapse of the Soviet Union. A hard-pressure Russia and Ukraine, keen to get their hands on foreign exchange to prop up their ailing economies, are pushing very hard for the project to go ahead. Although the Russians have their own launch pads, Western rocket manufacturers have successfully lobbied to

limit dirt-cheap launches from subsidised facilities owned by Russia and China. Launching from Australia would circumvent the bans and allow the Russians to sell as many rockets as there were customers lining up. The rockets are low-tech but reliable and cheap, and would likely capture quite a market, experts say. But the concept, first floated seriously in 1988 by the former Queensland Premier Sir Joh Bjelke-Petersen – something its proponents admit has not helped its image – has staggered from proposal to proposal and has yet to attract the big dollars needed to make it a reality. Not surprisingly – there are no privately-run commercial space launch facilities for big satellites anywhere in the world, as they all take place from government-owned launch sites. The proposal is not only brash and bold, it has never been done before.

But detailed analyses by the Space Office and industry groups have repeatedly found the project commercially viable. Everything suggests a Cape York spaceport, in a stable country near the equator, far from population centres and using cheap Russian rockets, could capture 20 per cent of the world launch market and be a howling success.

However, those companies which have been involved in the proposal have come on the scene and disappeared with equal rapidity. The original project developer became insolvent, another proponent failed to raise capital and a third – which claims to have secured substantial financial backing from a group of large international companies – recently lodged an official bid, but has yet to prove it can finance the venture. The deepest recession in 60 years has not helped free up the kind of cash needed, but the remaining bidder insists it is close to proceeding with the spaceport. If the venture did get built, the first commercial launches would not take place until 1998, Middleton says.

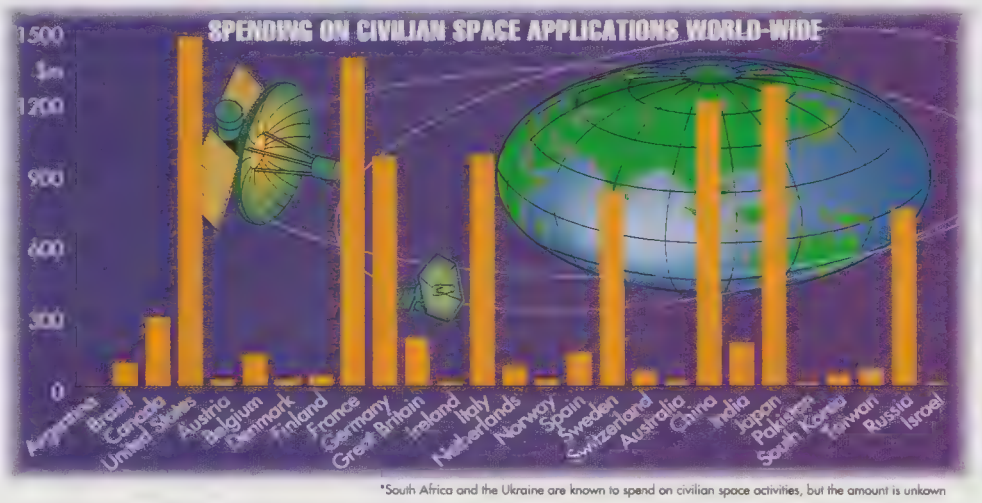
There are other space commercialisation projects the Space Office is pursuing, along with some space science and research funding seen as essential to keeping Australia on the cutting edge of technology. The office is funding the development of the Australian-designed Advanced Along-Track Scanning Radiometer, a satellite-borne ocean temperature sensor which promises to shed new light on complex climatic effects like El Niño; the Atmospheric Pressure Sensor, which will allow air pressure readings from space rather than force forecasters to rely on networks of meteorological stations scattered around the country; and the Global Atmospheric Methane Sensor, likely to become important in environmental monitoring from space. It is also funding co-operative centres with industrial partners to develop the sophistication to manufacture space products, which are meant to be self-funding within five years.

But Middleton admits, the public focus is firmly on the two space launching projects. If either project went ahead, Australia would move up a few rungs in the international space industry ladder and be well-positioned to develop a local technical and manufacturing capability for a 21st century market. If both proceed, Australia could find itself in the box seat of world space commercialisation.

Rather than blowing play money on space toys, space industry players are becoming more convinced they can make bucks from Buck Rogers. Spending on space projects in the Japanese government budget for 1993 is tagged at an all-time high of ¥201.7 billion, or $US1.63 billion. Much of the money is earmarked for development of the H-2 rocket capable to putting a 2,000 kg payload into geosynchronous orbit, building four new meteorological and Earth observation satellites and manufacturing portions of the US-led international space station Freedom. India last year launched and tested in Insat-2A, its second generation satellite to provide better communications capabilities, and advanced disaster warning, search and rescue services and distance education.

Insat-2B is to join its sister in June. Despite economic, population and environmental problems, the country sees the public benefit and industry development advantages of a space program. Spending only $US182 million a year, India has developed satellites, launch vehicles and ground systems capable of delivering space-based services in communications, meteorology, and resources management.

In all, the world spends an estimated $US25 billion annually on space (see table), through space programmes or other space expenditure. When comparing national space programmes, Australia spends very little, about 0.001 per cent of its Gross National Product (GNP). This compares with 0.11 per cent for France, 0.09 per cent for India, and 0.03 per cent for Canada, Sweden and Brazil. If Australia were to match Canada and Sweden's 0.03 per cent – the average for the lower-end of the scale – it would be spending about $90 million a year. The Australian space programme budget for the year to June 1993 is just over $6 million. The expert panel that reviewed the space programme last year recommended several initiatives to accelerate Australia's involvement in the space industry, and said the Australian Space Office's budget should be increased until it totalled $20 million a year by 1995, or about 0.006 per cent. ● **Wilson da Silva's last article for *21•C* was on artificial intelligence.**



NORMAN ROBINSON

*South Africa and the Ukraine are known to spend on civilian space activities, but the amount is unkown

PROJECTED DESIGN FOR A SPACEPLANE WITH MODULAR RECTANGULAR SCRAMJETS

SCRAMJETS ARE GO!

A team of Australians is building the space vehicles of the future.

Paul Hendy reports on the engineers with the right stuff.

You've heard of Roger Ramjet, now meet 'Aussie scramjet' – a spacecraft engine that might give rockets a run for their money in the orbital launching stakes of the future.

While many people have never heard of 'hypersonics' and 'hypervelocities', a small team of Australian scientists have become world specialists in scramjet engines and the design of superfast wind tunnels in which they can fly. With a little nurturing capital and, more importantly, political vision, scramjet proponents believe their new engines might be Australia's innovative ticket into an exclusive Asian satellite launching club, and a billion dollar marketplace of powerplants for next-generation spacecraft.

One thing is certain – if this unusual

propulsive technology can work at orbital speeds, it will issue in a new era of cheaper satellite delivery as well as safer, cleaner and more reliable spaceflight.

The oddly named scramjets are 'supersonic combustion ramjets'; simple aerodynamic engines without any moving parts such as compressor blades and turbine rotors. Unlike the slower-speed airbreathing ramjet, scramjets fly by having the air channelled and rammed into them so fast and at such high pressures and temperatures, that a small amount of hydrogen sprayed into the supersonic airflow spontaneously ignites, creating thrust.

Engineers hope that scramjets will help achieve single-stage-to-orbit (SSTO). The object is to create an efficient and powerful flight-weight motor that can 'airbreathe' from Mach 3 (from the turbojet limit) to orbital speed of Mach 22 (7.5 km/sec) by obtaining 80 per cent of its fuel – oxygen – directly from the atmosphere. Not only is this 'airbreathing' cheaper, lighter, and more energy efficient than a rocket motor, but also cleaner burning and less polluting, since the exhaust product of hydrogen combustion is water vapour.

In an age where even the cheapest rocket payload launch from China costs $40 million, the new engine is eagerly awaited. The conservative US Office of Technology Assessment estimates scramjet delivery is an attractive "$US800,000 per 9,000 to 13,500 kilogram payload", and more optimistic proponents calculate the savings at one-tenth the total launch costs of rocket delivery. Some US enthusiasts of re-usable scramjets claim costs might be as little as one per cent of rocket systems, when total infrastructure, materials and manpower costs are included. Theoretically, a scramjet burns fuel eight times more efficiently than a rocket at Mach 4, three times better at Mach 12, and even at Mach 20, it still manages to blitz the opposition.

Launching safety is another vital factor in an industry still having nightmares over the 'Challenger' shuttle disaster of January 28, 1986, which claimed seven lives, after a solid rocket booster failed. Scramjet-powered space vehicles will not carry such potentially explosive solid fuels, or for that matter 670 tonne external liquid-oxygen tanks the size of grain silos.

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Scramjets are the spacely obsession of Australian engineer Raymond Stalker, professor of space engineering at the University of Queensland. This aerodynamicist has spent the last 15 years developing the propulsive concept as a more innovative and efficient "bridge to space" to compete with a maturing rocket technology. Stalker claims scramjets are the "only real alternative to rockets".

The logic of cheaper and safer spaceflight is behind Stalker's scramjet vision, one which he has nurtured since 1964. Today, he is the world leader in orbital velocity scramjet design and testing.

In the basement of the University of Queensland's engineering building lies the powerful 'T4', a 45 metre long wind tunnel and the unique tool designed by Stalker which makes all the engine work possible. The tunnel is a world first in its own right. Known overseas as "Stalker tubes", the T4 design provides a hot, high pressure, airflow for the simulation of conditions to test experimental scramjets, as well as spaceplane models. NASA values the tunnels so much that it has been helping fund the Australian enterprise since 1985.

THE AUSTRALIAN NATIONAL UNIVERSITY'S FREE PISTON SHOCK TUNNEL FACILITY WITH SOME RESEARCH STAFF AND RESEARCH STUDENTS.

At the recent Third International Workshop on Hypersonic Shock Tube Technologies, held in Brisbane and Canberra, scramjet engineers and tunnel specialists from Germany, France, Japan and America, paid tribute to the "gurus" in the field. Professor Hans Hornung, director of the Graduate Aeronautical Laboratories at Caltech in Los Angeles, who is now in charge of the powerful 'T5' Stalker tube designed by WBM-Stalker, says that Stalker and his crew "know exactly what to build, and invent, and the next fields to study. Their research must be funded."

Currently, the Queensland wind tunnel is running at "1200 shots per year", with Stalker's modest-sized family of 30 (Continued page 92)

Consciousness, intelligence, the brain and mind, and the heart and soul. Such are the huge subjects of Professor Derek Denton's research. Susan Oliver interviews a man conscious of consciousness.

SOUL

What makes a chimp laugh and how smart is an octopus? Professor Derek Denton asks such questions and seeks the answers regularly. A pioneer in quantitative clinical bio-chemistry after the second world war, his research opened up new aspects of the whole science of human metabolism. With his colleague Dr Victor Wynn he pioneered intensive care and the manipulation of body chemistry to stabilise seriously ill patients at a time when surgeons returning from war in the Pacific were more inclined to cut first and ask questions later.

Denton was the founding director and is now emeritus research professor of the Howard Florey Institute of Experimental Physiology and Medicine in Melbourne. A man who believes "nature intrigues from a philosophical and biological point of view" his most recent publication *The Pinnacle of Life – Consciousness and self awareness in humans and animals* shares this intrigue with its readers. It is a publication which will lead many to question not only their own ways of thinking, but even those of their cats and dogs.

SUSAN OLIVER: *Your book* The Pinnacle of Life *addresses some age old questions in a refreshingly matter-of-fact way. These questions are intriguing but society seems to be remarkably unenquiring when it comes to a fundamental understanding of mind, brain and what we believe distinguishes higher orders of life from lower orders. It's almost as though in recent times we have rejected religion so we have rejected some of the questions.*

DEREK DENTON: The dualistic notion of the structure of the human being comes from the religious context, namely there is a mind and body, and that the term 'mind' is in a way synonymous with the 'soul'. It therefore has a religious overtone. Religion has been significantly pre-occupied with these sorts of questions. The view I'm taking is that there is nothing metaphysical in that sense, about consciousness. It's something that has evolved though the march of life from the primeval slime up to the human cortex with all its prodigious capacities. It's a Darwinian view.

The pinnacle?

The pinnacle yes. But consciousness and the mind is what the brain does, not withstanding the question of how the brain does it – which is of course incredibly complex. It constitutes the biggest enigma in biological science; it is almost overawing when you consider the problems of analysing it scientifically. Richard Dawkins in *The Blind Watchmaker* refers to "an affirmation of incredulity", which is a wonderful phrase. He used it to categorise the anti-evolutionists who had difficulty or an impasse in accepting progressive evolution could account for the emergence of the human eye. There is no such affirmation regarding consciousness in my book but I suggest it may take a very long time to work it out.

Paul Davies and others say that the gap in our understanding has to be God, but you're saying people will know one day through the processes of analysing and understanding.

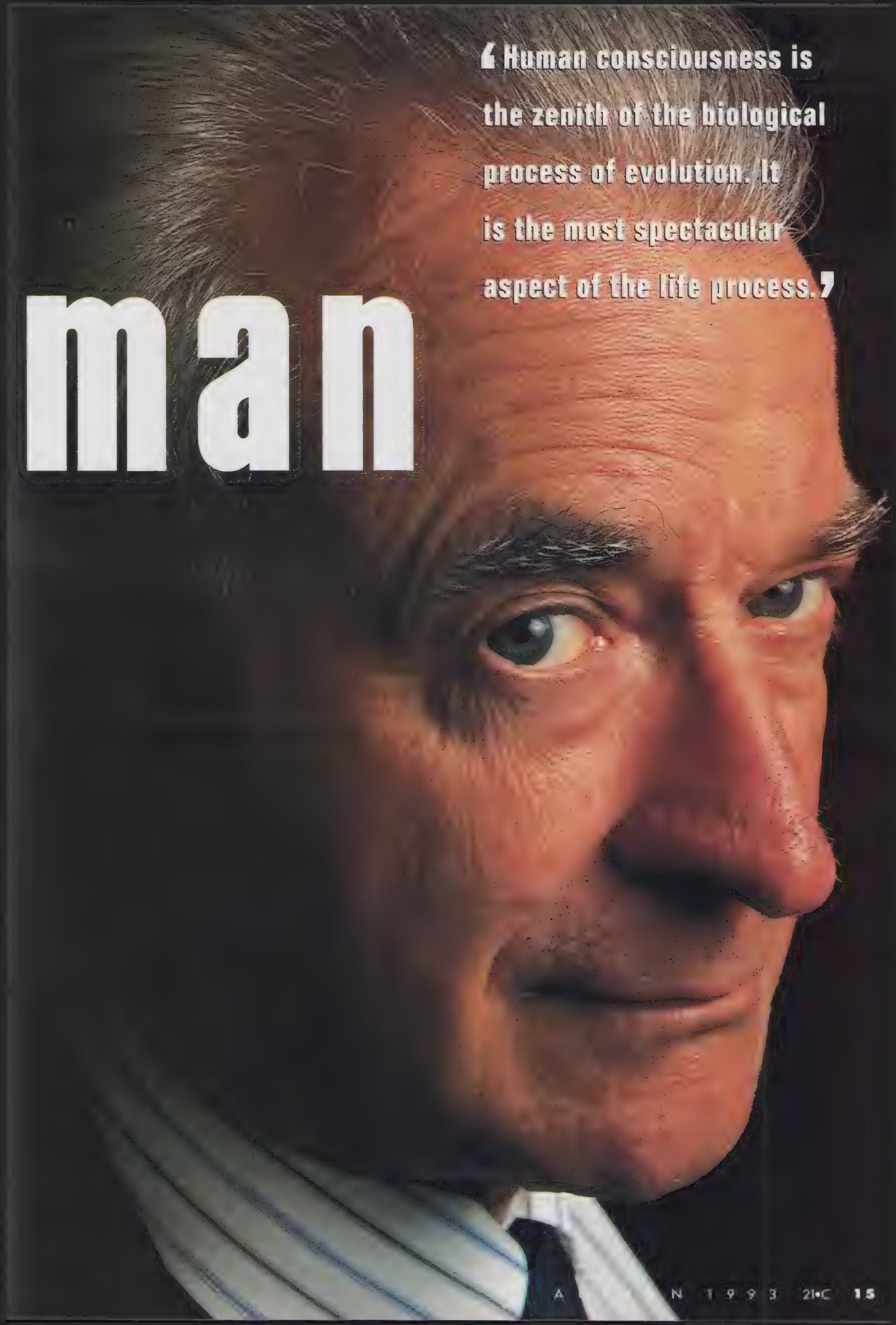
Yes. I think understanding of what constitutes the mind will advance enormously. We are dealing in one sense not with philosophical argument but with experimental data. It is a question of how you interpret it. I like the view of Elizabeth of Palatine who was obviously a brilliant lady. Elizabeth floored Descartes with her arguments. Descartes proposed that there was a mind and soul separate from the body. Elizabeth said she might perhaps concede the notion that a non-material entity – the mind – might influence the body, but she had great difficulty with the question of how the information got from the body to the mind. Descartes then put the argument foreword that it's like gravitation, the two things influence one another. Elizabeth said that that was a rather bad analogy, because, after all, gravitation was between material things. Descartes conceded. She won that point and then she said that if this mind is an immaterial entity and separate, how come it is so overcome by an attack of the vapours? And that is really a straight experimental issue.

If you fill your body with alcohol, it is not that your speech faculties – the motor mechanisms of the brain – are deranged, it is that the thinking of the mind is deranged. It is not in that sense, to me, separate from the brain. What Descartes says is that this is one of the penalties that the mind pays for being so closely associated with the brain. To me that's getting perilously close – if not actually saying – the mind is the function of the brain. The other view is that there is something separate, the notion of unity of self and a separateness of the mind from the brain. In considering this, one of the crucial issues is Sperry and Gazzaniga's work on the split brain. You can divide the brain, which is done for people with intractable epilepsy so as to stop a grand mal fit going from one side of the brain to the other. You divide the corpus callosum which conveys 300 million or more fibres from one side of the brain to the other. It is part of the whole gigantic integrative system. There are probably thousands of messages per second going back and foreword.

Now if you divide that, the crucial piece of information

man

"Human consciousness is the zenith of the biological process of evolution. It is the most spectacular aspect of the life process."



emerging is that you can have two separate cognitive processes – the left side of the brain has no idea what the right side of the brain knows. The right side can operate on information which is by an experimental procedure deliberately and exclusively fed to it. The left side of the brain, in a right handed person, is the speaking interpretive part and it may make wild guesses about it, and indeed the right side of the brain which knows the answer, may even express annoyance. But the crucial thing is that there can be two separate processes of knowing in the two hemispheres. And that indicates that awareness and cognition is a function of neural tissue in action. There is no "I" or singular entity or integrative soul in these circumstances. In the discussion I had with Sir John Eccles, he suggested that the right side of the brain is a rather dumb element – not a real person – relative to the left side, which is the interpretive mathematical side. I said does that mean that you would put the soul in the left interpretive cortex? He said yes, and then no, no, no! I think he felt that that could have some problems. In my eyes there is actually a spectacular ecclesiastical problem with it, because all the work on the left and the right brain from the split brain patients, shows that the right brain is where the aesthetic evaluation – the appreciation of beauty – resides, which on the face of it is supposed to be one of the elements of the immortal soul and one of the most pleasant things about the human being. The left, interpreting cortex, can't tell beauty from beast, it has no aesthetic judgement. There are enough people with a split brain that in one or two it is possible that a stroke will wipe out the interpretive cortex. Would they be without a soul, even though they have complete appreciation of beauty and aesthetics in their right hemisphere? It is a bit like Anatole France in his book *Penguin Island* where St. Mael baptised the penguins on Penguin Island because he was short-sighted. He provided a serious ecclesiastical problem in heaven, and St Catherine, who was God's counsellor, explained after he had got all the other advice, that the only possible solution was to give them a soul – but a small one!

The right brain is where the aesthetic evaluation resides which is supposed to be one of the elements of the immortal soul.

You have raised the issue of animals and what separates them from humankind and the issue of humankind's claim to superiority.

In the book I raised the question as to whether animals have some aesthetic sense. Professor Thorpe from Cambridge has raised it with bower birds, who make a structure in a uniform colour, and if you put something in of the wrong colour they will remove it – maybe there is an aesthetic pleasure in what it is doing. The same issue arises in relation to bird song – birds actually invent and make variations on what they're doing. A lyre bird imitates a kookaburra for example, which is an extraordinary process; it has to have listened and memorised it and then it has to have some sort of... it's probably going to far to call it a concept... of what it is going to do – is it doing it right?

It's that interchange between left and right brain.

I don't know about that. Birdsong in some species is represented on both sides of the brain. Maybe it's like Joan Sutherland in rehearsal. The birds have to audit what they are doing. If a creature can mimic, it involves doing something which is not part of its instinctive repertoire. A dolphin can watch turtles and seals in their tank and it will imitate them, lie on its back and flap like a turtle. Another example which is even more spectacular is dolphins getting a piece of tin or something from the bottom of the tank, and scraping the walls of the tank and making bubble sounds, just like the man with the aqualung that goes into the tank to clean the windows. It appears that the dolphin has observed a sequence of events. It has, in some way, an image of that because to imitate the actions it has to control its own muscular contractions in precise sequence.

And perhaps a sense of humour?

That's not impossible. That's been argued with chimpanzees and gorillas. The argument against that is they might be making a highly intelligent appraisal of the behaviour of their trainers. If they do something which is wrong and the trainer shows a reaction to it, the gorilla subtly appreciates that it pleases the trainer. That is because it seems funny to the trainer and therefore the ape does it because it gets results. That may not necessarily mean it has got a sense of humour.

But it's a long way from just looking for rewards in terms of food, which is the Pavlov dog sort of thing. I was interested whether or not what you are exploring is in the evolutionary path? Do animals evolve to a higher level of intelligence- soul-mind, however you define it?

One of the things inherent in the idea of mind in an animal is if the creature shows evidence of having an intention or a goal. If it has a goal, and fulfils it, then that bespeaks that it is able to form a model, or I use the term 'image', of the external world. That, in a way, is a crucial element in the definition. There is no question that animals can show evidence of intention. Miriam Rothchild tells a lovely story about a collie dog. Collies are much more intelligent than the dumb labrador. There was a favourite chair of the collie, so when the dumb labrador occupied the chair, the collie would get a ball and make it bounce. The labrador would jump out to get it, and the collie would jump up into the chair. That is a fair indication of intention. One of the most interesting examples and one of the first descriptions was about a chimpanzee that was shot, and it had a little baby, so the baby actually joined the hunting party and became one of them, as it were. And it showed most charming and interesting behaviour, it used to leap into bed with them at night, it liked company when it was asleep, snuggling up and (Continued page 95)

NEXT

NEWS AND TRENDS

NEW TECHNOLOGY TO AID HEART DISEASE

Useless "digging muscle" to support dicky hearts

Shortly, someone with a weak heart will become the first Australian to undergo a radical new operation called "muscle wrap", or cardiomyoplasty.

The procedure will be neither as dramatic or as traumatic as the first heart transplant. But, for a patient with a heart condition of intermediate severity, it may offer a new lease of life at reasonable cost ($20,000-30,000 as against $150,000 for a transplant).

One in every four Australians dies of heart attack, often after a second episode. This new surgery offers hope for avoiding a second, fatal attack. An intensive collaborative effort is under way in Australian research to provide the hi-tech device needed by patients undergoing the procedure.

In the operation a cradle of human muscle is grafted around a heart weakened by cardiovascular disease and gives the heart a boost of natural power.

The promise of artificial hearts for the same purpose has not been realised, due to problems of getting power to a mechanical pump implanted inside the chest cavity and the tendency of blood to form lethal clots in the plastic pipes.

The muscle-wrap technique leapt into public prominence with news coverage of a forum on heart research which was part of the official opening of the new Cooperative Research Centre for Cardiac Technology at the University of Technology, Sydney (UTS).

Two Sydney surgeons are readying themselves for the operation. Dr Peter Brady has been doing research on the technique using sheep at the Royal North Shore Hospital. Dr Phillip Spratt operates at St Vincent's Hospital. Both hospitals are partners in the Research Centre.

Only about 300 of the operations have been done world-wide (mainly in France, Brazil and the US), where it has produced promising results.

The surgeon removes a muscle from the back, known as Lattisimus Dorsi (in dogs it is the "digging muscle"), and wraps it around a diseased or damaged heart to give it sufficient strength for pumping life-giving blood around the body.

Remarkably, the digging muscle seems to have no function in the upright human. Patients who have undergone the graft report virtually no impairment of movement, while enjoying a markedly increased supply of blood.

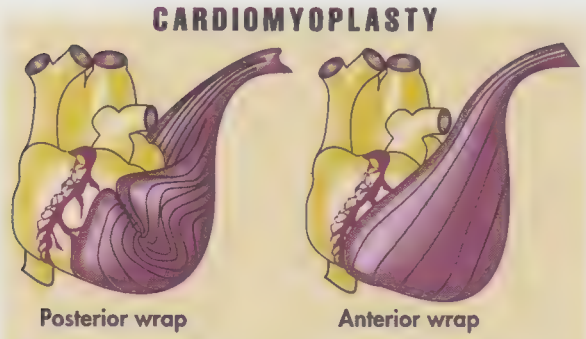
Once wrapped around the heart, the displaced muscle has to be zapped with electric pulses to make it contract with the same rhythmic beat as the heart's own, weakened muscles.

This is where Australian research comes in, as a new kind of heart pacemaker, or stimulator, is needed to allow muscle-wrap surgery to become a standard procedure.

The first Australian recipient will be dependent on an American-made stimulator. But Telectronics Pacing Systems, a Sydney-based partner in the Centre, has also developed a stimulator which the Centre's director, Professor Stephen Hunyor, believes is superior. The scene is set for hot competition between the Australians and the Americans.

Telectronics pioneered pacemakers 30 years ago and holds third place in production, with world-wide sales of $300 million annually in a market worth over $1.5 billion annually.

According to Mr Keith Daniel of Telectronics, ➤



The usual procedure uses a posterior wrap. An anterior wrap is used when the primary pathologic condition involves the anterior wall of left ventricle.

Implanted hardware needed are a Cardiomyostimulator, the two intramuscular pacing leads, and the epicardial sensing lead.

Source: The Journal of Heart and Lung Transplantation

➤ there will be a global need for 300,000 stimulators (10,000 in Australia), with the value of the market doubling each year to an annual $1.5 billion.

Professor Hunyor said the Centre has assembled a talented team for researching "the outstanding issues to be answered before the place of cardiomyoplasty in the overall management of heart failure becomes clear.

"The many people with a constantly besieged and battling pump are at last being given new hope. This hope is born out of modern scientific research, Australian technology and creative but pragmatic surgical technique."

Shocks for the rhythm of life

"Being kicked in the chest by a horse" and "getting a body start from King Kong" are how heart attack victims have described the electrical shock treatments needed to prevent fatal, second attacks.

These are patients whose hearts are prone to lose their regular rhythmic action and require the implantation in their chests of automatic 'defibrillators'. These devices contain a battery and capacitors to store the energy for the electrical kicks needed to restore normal rhythm before it is too late.

While these are remarkable pieces of electronics, the defibrillators cause pain and tissue damage due to the large shock used. Associate Professor Loraine Holley of the University of Technology, Sydney and a program leader in the new Cooperative Research Centre for Cardiac Technology said that researchers do not know how the shock does, in fact, work on heart cells.

The surgeon's knife, drugs and electrical shocks, she said, can help to prevent death from heart attacks but, generally, are only available *after* the first attack.

The big challenge to research is to find a reliable indicator of susceptibility to heart attack and a therapy to prevent it.

Is the cure worse than the disease?

The current theory on the cause of disease of the arteries which supply blood to the heart makes sense but may not be the last word, according to Dr Merilyn Sleigh.

Atherosclerosis, as it is called, is the major cause of death in Western populations and can affect blood supply to many parts of the body as well as the heart.

The risk factors which increase the chances of developing thickening and blocking of the arteries include a high fat, high cholesterol diet, smoking, high blood pressure and genetic make-up, Dr Sleigh said. In times of stress, like climbing a hill or a hard game of tennis, the arteries may not be able to expand to increase blood flow and oxygen supply in response to the heart's demands.

The result is either chest pain (angina), or a heart attack caused by a blood clot in the arteries around the heart.

Dr Sleigh, who heads research into vascular cell technology at the CSIRO in Sydney and is visiting professor at the University of NSW, said that the 'cures' for unblocking the coronary arteries may be worse than the disease.

The treatments usually recommended by cardiologists range from doing nothing, through drugs, coronary by-pass surgery, expanding the arteries with balloons (angioplasty) and scraping the blockage out of the arteries (endarterectomy).

"All of these procedures suffer a very high failure rate – no so much in the short-term, but in the six to 12 months following the operation," said Dr Sleigh.

Balloon angioplasty is so popular that a million operations have been performed world-wide by this year. Yet, the failure rate is running at about three or four in every 10 patients whose arteries thicken again in six to 12 months after the operation.

"There is no way of telling which patients will undergo the unfavourable response," Dr Sleigh said. The only way of monitoring the outcome is to subject patients to an unpleasant and sometimes dangerous examination by angiography. In this a radio-opaque dye is injected into the coronary arteries and X-ray pictures taken to reveal the blood flow and blockages.

She reported that an American group has caused great excitement with the "dramatic results" of tests in animals of a procedure which suppresses one of the genes which cause cells in the arteries to proliferate and reduce the blood flow.

However, Dr Sleigh's group opposes this approach and does not believe it will lead to a clinical treatment. The Australians are researching, instead, ways of gently restoring arteries to a "normal" state as quickly as possible by avoiding the continuing and excessive growth of cells.

Dr Sleigh estimated that a drug or medical device which would achieve this goal would be worth over $500 million a year.

Genes in the heart

While surgeons and technologists are perfecting techniques for restoring the whole heart to adequate function, other scientists are trying to find out what causes cardiovascular disorders at the micro level of genes and molecular biology.

Professor Robert Graham is investigating what he called 'the ears of the cell' – the protein molecules on the surface of cells which respond to signals of stress in the body, such as a fright, an accident or a disease.

Professor Graham is an Australian who directs heart and hypertension research at Case Western Reserve University in the US. He is an international adviser to the Cooperative Research Centre for Cardiac Technology.

On recognising the presence of hormones produced by stress, such as adrenaline, these 'receptor' proteins cause the arteries to constrict and the heart to pump faster. This regulates the flow and pressure of blood so that the body can respond quickly to the stress.

But, if the receptors do not respond normally, high blood pressure, heart attack or stroke may follow. Drugs which stimulate or block these receptors are widely used for treating these disorders.

THE SURGEON'S KNIFE, DRUGS AND ELECTRICAL SHOCKS CAN HELP TO PREVENT DEATH FROM HEART ATTACKS BUT, GENERALLY, ARE ONLY AVAILABLE AFTER THE FIRST ATTACK. THE BIG CHALLENGE TO RESEARCH IS TO FIND A RELIABLE INDICATOR OF SUSCEPTIBILITY TO HEART ATTACK AND A THERAPY TO PREVENT IT.

Professor Graham said it is therefore important to understand exactly how the receptor proteins are made up and work.

Despite the profound effect they exert on our health, the receptor proteins are so rare that they form only one-thousandth of one per cent of the proteins on the 'skin' of cells, making them exceedingly difficult to purify and study.

Nonetheless, Professor Graham's group has been successful in using molecular biology and 3-D computer models to understand the crystal structure of the receptors and how they work. He said discoveries in basic research like these will greatly

influence the understanding of heart disease and its alleviation.

Vulnerability [illegible] attack identified

A research group at Sydney's Westmead Hospital has found an answer to one of medicine's most challenging questions: Is it possible to predict who will suffer a fatal heart attack?

Professor John Uther's group studied patients in Sydney's western suburbs which he describes as "heart attack prone". Professor Uther, chairman of the Division of Medicine at Westmead, is a member of the new Cooperative Research Centre for Cardiac Technology.

The grim fact the group faced is that one in 10 of the patients who pass through their coronary care unit drop dead within a year, suddenly and without warning.

The researchers found that, if such people were reached in time to forestall a fatal collapse, an electrocardiogram would show chaotic beating of the main pumping chambers of the heart.

Those rescued from sudden collapses could usually be made to have a disordered heart rhythm again at any time, simply by stimulating their hearts with tiny electrical pulses, as applied by pacemakers.

Professor Uther said that electrical recording from the heart during surgery in these patients identified little areas of heart muscle where electrical activation of the muscles was delayed.

When the surgeon removed these areas of muscle, the disordered rhythm was usually cured. Under the microscope, the muscle appeared unusual – there was a lot of normal, active muscle running through scar tissue, damaged in the earlier collapse.

To identify patients, whose hearts were moderately damaged from a first heart attack and who were most at risk of another attack, the doctors gave them a pacemaking stimulation and watched to see if their hearts went into abnormal rhythm.

When an abnormal rhythm could not be induced before the patients left hospital, the chance of a later, fatal attack was one in 25.

When the test did provoke an abnormal rhythm, the odds jumped to one in two of the patient later dying suddenly, or of experiencing a spontaneous attack of 'arrhythmia' and being lucky enough to get to hospital in time.

Having identified a group of patients with a major risk of a lethal arrhythmia, the Westmead team found that coronary bypass surgery is "quite ineffective" as a treatment.

The scarring of the heart muscle is permanent and continues to cause sudden lapses into disordered pumping of the blood. Drugs, too, have been ineffective.

Professor Uther said the next step is to try the effects of implanting an automatic device called a defibrillator in the vulnerable patients.

Astronomers probe mystery of missing matter

This is a challenge accepted by many astronomers. Two Australians, working at opposite ends of the globe, are tackling the problem with a new method for weighing galaxies.

So that they can predict the future of the universe astronomers need to know how much mass there really is in it.

If the total mass is below a particular level, the universe will go on expanding, as it has done since the Big Bang. If the mass is above that level, gravity will eventually overcome the forces of expansion and the universe will collapse. (Fortunately for us, a Big Crunch would be some billions of years away).

Measuring the missing matter depends on accurate estimates of the mass of the universe. Trying to weigh the Sun is hard enough. But, by doing a few observations of the planets, we can use Newton's Law of Gravity to estimate the mass of our parent star pretty precisely – it is 1,900 million million million million tonnes or 317,000 times the mass of the Earth.

When it comes to weighing a galaxy, which lies anything from millions to billions of light years away and is made up of hundreds of billions of stars like the Sun, scientific ingenuity is stretched to the limit.

And, there is a major disagreement among astronomers over the true mass of a galaxy and, hence, of the universe which is apparently made up largely of galaxies like our own, the Milky Way.

By estimating the number of stars seen in the visible part of the spectrum, the optical astronomers have come up with a figure for the mass of a galaxy of 10,000 million times the mass of the sun.

Their colleagues in radio astronomy, however, have another figure – 100,000 million solar masses – which comes from their ability to study the motions of galaxies.

The radio estimate is 10 times greater than the optical. That's an awful lot of stuff unaccounted for, and makes for big trouble when testing theories about the evolution of the universe. The huge disparity is the so-called "missing mass" in the universe.

Otherwise known as "dark matter", this is stuff astronomers think, from calculations, must be out there but they haven't yet "seen" it with any telescopes.

Dr Richard Wielebinski and Dr John Whiteoak believe they will be able to sort out the dilemma by "weighing" a few galaxies with greater certainty than ever before.

Their ambitious project will co-ordinate observations from the Australia Telescope in New South Wales and the European Southern Observatory in Chile.

Dr Wielebinski, a Polish-born Australian, has been executive director of the Max Planck Institute for Radioastronomy in Bonn, Germany, for seven years. Dr Whiteoak is deputy director of the Australia Telescope National Facility. Their quest has won them jointly a valuable Max Planck Prize in Germany to support their collaboration over three years.

In the Andes of Chile, Dr Wielebinski's group is using a radiotelescope to examine, in detail, the spectrum of carbon monoxide in six selected galaxies.

Meanwhile in Australia, Dr Whiteoak is looking at the radio emissions of hydrogen atoms from the same galaxies, using the radio dishes of the Australia Telescope.

A galaxy spins at different rates according to how far its stars lie from its centre. The carbon monoxide is "seen" in a galaxy mainly near the centre while the hydrogen is "seen" at the outer edges. Measuring the tell-tale signals of carbon monoxide and hydrogen and taking into account the slowing-down effect of magnetism on the stars' motions will indicate how fast the galaxy is rotating. The Australian/German search will yield a more precise measure of the true mass of each galaxy than is possible from the wildly different estimates of the present.

From this, the worry of all that mysterious, dark matter may be eliminated. Indeed, the missing stuff may even turn out not to be missing after all.

LEFT: PROFESSOR RICHARD WIELEBINSKI, EXECUTIVE DIRECTOR OF THE MAX PLANCK INSITIUTE FOR RADIOASTRONOMY, AND DR JOHN WHITEOAK, DEPUTY DIRECTOR OF THE CSIRO AUSTRALIA TELESCOPE NATIONAL FACILITY.

The twinkling dilemma

Since the beginning of their other worldly explorations, astronomers have desperately wanted to see sharper images of stars to get, for example, direct evidence of planets outside of our own solar system. But the irregular movement of air in the atmosphere causes shimmering of incoming starlight which could not be eliminated.

ABOVE: DR SCOT OLIVIER AND PROF JOHN DAVIS. BELOW: THREE OF THE SIX ANTENNAES OF THE AUSTRALIA TELESCOPE AT NARRABRI. PHOTOGRAPHS: PETER POCKLEY

Now, with 'star wars' technology which uses high powered lasers to form artificial stars, mirrors which change shape 1000 times per second, computer controls and multiple telescopes which combine their images, astronomers are on the verge of defeating the twinkling dilemma.

With them, some of the major unknown questions about the universe may be answered – for instance, will the present expansionary phase eventually turn around to a catastrophic contraction?

The exciting prospects emerged when 200 radio and optical astronomers from around the world came together for the first time in Sydney recently to exchange ideas on how to beat the limitations of the atmosphere, of the physics of light and radio waves and of engineering.

Professor Bernard Burke of the Massachusetts Institute of Technology predicted that, soon after the turn of the 21st century, the new techniques will enable detailed studies of planets circling distant stars and quasars (galaxies with intense radiation which still mystify scientists).

Within 40 years, Professor Burke believes, the world's major nations will cooperate in establishing a permanent base on the moon and that astronomy will be a great beneficiary as telescopes will be freed of the limitations imposed by the Earth's atmosphere.

Burke suggested that a giant X-ray interferometer would be built on the moon which could study the surroundings of the massive black holes which seem to be at the core of quasars. (An interferometer combines the signals from two or more receivers to form a sharper image.)

The astronomer's passion is to understand the complex processes which make the cosmos tick by squeezing more information from the light and radio waves reaching Earth from the stars and galaxies.

To the naked eye twinkling stars are attractive, romantic even. But, look at a few stars through even a moderately powered telescope and the dancing, fuzzy images make you realise the formidable frustration experienced by the professional astronomer.

Overcoming such barriers has been a continual challenge to scientific and technological ingenuity. The theoretically simple solution is to put a telescope above the interfering atmosphere – on a satellite or the moon.

But, that is immensely expensive and, as troubles with the mirror of the first satellite-borne instrument, the Hubble Space Telescope, have shown, is not without major technical difficulties.

For decades earth-bound astronomers have pushed back the boundaries of the observable cosmos by building larger mirrors and dishes. These have collected fainter signals and thus pushed our knowledge further back in time to the older stars and galaxies formed soon after the cataclysmic explosion of the Big Bang which created our expanding universe.

These massive optical telescopes and radio dishes are approaching the limits of engineering and materials, not to mention finance which, for astronomy, comes almost exclusively from the public purse.

And, no matter how big optical astronomers build their "light buckets", the mirrors cannot produce much sharper images of the stars. Their prime purpose is to collect fainter light from deep in space and, by analysing its colour, to learn about the composition and movement of the galaxies.

With a mirror of 3.9 metres, Australia's largest is the Anglo-Australian Telescope (AAT) on Siding Spring Mountain in northern NSW. The world's largest, just coming on line in Hawaii is the Keck Telescope with a diameter of 10 metres achieved by using a mosaic of smaller mirrors rather than a single slab of polished glass.

The Keck will be able to focus down to an angle about three times smaller than the AAT. As the massive structure tilts over to follow the motion of a star or galaxy across the night sky it will flex and would cause distortion in the image from the mirror but for some 'smart' active optics which continually make corrections.

Radio astronomers have enjoyed almost complete freedom from the twinkling effect because the radio waves from galaxies travel unhindered through the atmosphere. However, radio waves, being at the long end of the electromagnetic spectrum, yield images of target objects which are coarser than photographic images taken in the visible part of the spectrum.

Radio dishes have been made larger for collecting fainter signals, but there is a physical limit of about 100 metres for building a single, steerable dish. (Australia's 'giant' dish at Parkes, now 32 years old, is 64 metres across.)

In order to get more detail into the radio 'pictures' of galaxies, arrays of dishes have been linked across continents, and the signals combined by interferometry. Very Long Baseline Interferometry (VLBI) simulated the effect of a single, huge dish the size of the distance between them – anything from one to thousands of kilometres.

The latest technical game for both optical and radio astronomers, called Very High Angular Resolution, is bringing them together to solve common problems in producing images with finer and finer detail. The greater the resolution, the smaller is the angle, or detail that can be separated and new technology is now enabling the optical end to catch up with the capabilities of radio.

The ultimate radiotelescope now being built, is Space VLBI. It involves a Russian and a Japanese space mission each sending up a radio dish to orbit the Earth in the next two to three years.

By remote control, the space dishes will be trained on distant galaxies at the same time as ground-based dishes. When the signals are combined electronically the effect will be of a single dish up to 80,000 km across.

Dr David Jauncey of the Australia Telescope

(itself a VLBI instrument, with dishes at Narrabri, Coonabarabran and Parkes in NSW) says Space VLBI will give radio images 1000 times sharper than the (optical) Hubble Space Telescope was designed to achieve and 10 times better than ground-based radiotelescopes linked by VLBI. Australian astronomers are vital to the coordinated enterprise as they are providing the base for observing objects visible only from the Southern Hemisphere.

Exemplifying the internationalism of the astronomical community, Dr Leonid Gurvits, a Russian, is project scientist for the Space VLBI mission and is currently working at the Arecibo radiotelescope in Puerto Rico in the USA.

VLBI with ground-based telescopes is now so good that (if they wanted to) astronomers could resolve the size of a coin on the surface of the moon, Dr Gurvits said. Space VLBI will give images 10 times sharper than that.

Dr Gurvits' aim is to apply VLBI to questions on the cosmological scale. He wants to study the dimmest and most distant (and, hence, the oldest) galaxies which were formed soon after the Big Bang some 18-20 billion years ago.

He needs the resolving power of VLBI to get an estimate of the so-called deceleration parameter which measures whether the universe will carry on expanding for ever and ever, or whether its expansion will slow down until it reverses and collapses in a Big Crunch.

An example of how finer pictures from radio-astronomy can lead to surprising discoveries is the story of the ice being found on Mercury. This is the planet nearest to the Sun which has a daytime temperature on most of its surface of about 430 degrees above the melting point of ice.

"It's like a snowball in hell," said Professor Duane Muhleman, of the California Institute of Technology, at the conference in Sydney.

The Caltech group bounced radar signals off Mercury using the Very Large Array of radio dishes in New Mexico. The detailed image of the planet showed a bright spot at Mercury's north pole similar to the ice found on Mars and Jupiter. Being further from the Sun than Earth, Mars and Jupiter have temperatures below freezing.)

A similar icy patch has been found on Mars' south pole, using the giant radiotelescope at Arecibo in Puerto Rico. Prof Muhleman believes that any water on Mercury's surface has been vaporised by the intense heat of the Sun and has travelled to the two poles where it has frozen to ice. There are probably depressions in the poles which act like "cold fingers" which the Sun's rays never get into.

New technology is permitting the optical astronomers, for the first time, to emulate their radio colleagues and combine the signals from more than two or more mirrors to form a detailed image of a star in visible light.

CONTINUES ON PAGE 22 ➤

Greenhouse Revised

The latest greenhouse scenarios from CSIRO are far more cautious than those of 1990 and 1988, revising impacts expected by 2030 to occurring a century or more later. In particular, greenhouse is not expected to significantly lower winter rainfall in the wheatbelt country of south-west Western Australia as originally predicted by 2030. Even by 2070, CSIRO's Climate Impact Group predicts that greenhouse effects on winter rainfall in the west are expected to be zero.

Canal and coastal development begin to take on a less risky profile than under previous CSIRO scenarios. Sea level rises have been revised downwards to a range of 5 to 35 centimetres, a far cry from the general rise of 20 to 140 centimetres expected by 2030 in CSIRO's 1988 forecast.

Annual mean temperature predictions have been reduced by two-thirds. Previous scenarios had temperatures soaring by an average of 2 to 4 degrees centigrade by 2030. The new average of the estimated warning for Australia is put at only one degree centigrade.

Upper atmosphere scientist and environmental consultant, Dr Brian J. O'Brien regards the latest cautious CSIRO scenarios as "partial vindication for my campaign over the past three years to have more rigorous science and rational debate injected into greenhouse.

"Australian strategic priorities," he believes, "must be redirected away from greenhouse towards El Nino-Southern oscillation events, so important in causing droughts and floods that already cost hundreds of millions of dollars in eastern and northern Australia."

Eco-Redesign launch

Manufacturing production is increasingly driven by the environment debate – or at the very least now has to take into account the environment, commented Simon Crean, the federal minister for primary industries and energy. Mr Crean was launching the 'Eco-Redesign' project at the national Centre for Design at RMIT.

One of 32 centres of excellence in design around Australia, the Centre for Design is embarking on a project whereby they will 'eco-redesign' products to make them environment-friendly. The federal government has put $540,000 towards the project which has been matched by manufacturer, Kambrook, who already produce energy-saving irons and toasters, as well as kettles fabricated from recycled plastic.

Mr Crean described the 'Eco-Redesign' project as a means of "keeping ahead of the pack in design innovation" and of "spawning a new direction in green industries". With the support of the Federal Department of Arts, Sport, Environment and Territories, the Centre has established a database of ecodesigned products from around the world to assist Australian research (see *21•C*, Summer 1992, p 72). The 1500 citations in that database clearly illustrate the rate and scale of new green production. Environmental issues have come to take central place in the marketing, management and production strategies of major companies. The International Business Council for Sustainable Development, in its report to the UNCED conference in Rio, labelled this shift as an "eco-efficient industry movement", seeing a significant re-orientation of production emphasising design for disassembly and recycling, extended product life (EPL), reducing impact in use and replacing existing products with new, less environmentally damaging ones.

The 4th National Environment Expo

Once again the School Projects Display will be a feature of the 4th National Environment Expo, to be held at the Royal Exhibition Building, Melbourne from 10-18 April, 1993.

Hosted by the Australian Commission for the Future and sponsored by Apple Computer Australia, Victorian schools are invited to present their environmental projects to a public audience of over 100,000. In 1992, 35 schools participated under the banner 'Caring for our Planet'. Projects included T-shirts printed with environmental messages (Chisholm College), a model of a trout farm, complete with fish tank from Salesian College, and expansive displays on endangered species, local tree plantings and recycling.

To present your school's environmental project, contact Denise Cooney on (03) 819 0211.

At its display stand at the Back to School Science Expo, the Australian Commission for the Future ran a competition asking children to describe in under 150 words what they would regard as the most important features of the ideal city of 2021. The theme which shines through the large number of entries is the idealism of youth. Most are looking forward, however, to the advent of the hi-tech "wired city".

To give some idea of how the youth of today view the ideal city of the future, here's the winning entry by Adelaide Worcester from Ferntree Gully, Victoria.

"The ideal city of 2021 would be environmentally friendly – all waste products would be fully recycled or thoughtfully disposed of. There would be equal opportunities available for all, regardless of sex, race or religion. There would be accommodation and work prospects available for those in need. The working environment would make extensive use of computers and other technology, and no person would be in the dark about how to use computers, and everyone would love each other and be happy. The end."

Winning entries received a free subscription to *21•C* magazine.

Until now, optical telescopes have only seen stars as single points of light which, at high magnification, have edges blurred by the effect of the atmosphere (apart from the Sun and planets).

Compensating for the effect of the atmosphere on starlight was first achieved in Australia by Professor Robert Hanbury Brown, then of Sydney University. He returned from his retirement in the UK for the Sydney conference.

At Narrabri in the '60s and '70s Professor Hanbury Brown's Stellar Intensity Interferometer achieved world fame by measuring the true size of stars for the first time. With the limited technology of the time his design and achievement in measuring 32 stars was outstanding.

The Sydney University Stellar Interferometer (SUSI), a brand-new successor to the Hanbury Brown instrument, is now being commissioned at Narrabri. Professor John Davis said SUSI will compensate for the twinkling effect by combining light from pairs of mirrors up to 640 metres apart.

SUSI is being tested at progressively larger baselines and has recently achieved a world record for a working optical interferometer at a separation between mirrors of 80 metres (30 metres, on Mt Wilson, Ca., is the largest to date in the US.)

When fully operational, SUSI will be measuring the sizes and temperatures of stars of all types, information which is vital to understanding stellar evolution. Like its predecessor, SUSI compensates for atmospheric turbulence without the expensive technology of laser 'guide stars'.

SUSI is engaged in a race, though, with other instruments using the same principle in the USA and the UK. (In a highly competitive field where being first matters, the Sydney scientists experienced the excruciating frustration of a year's interruption in the continuity of their Federal funding.)

A competitor to SUSI, the Big Optical Array (BOA), is being built in Arizona. It is similar to SUSI but extends over 400 metres with the light passing through a vacuum (in SUSI it passes through air). BOA has three arms in a Y-shape and will produce detailed pictures of stars and galaxies.

Another instrument in the same class is the Cambridge Optical Aperture Synthesis Telescope (COAST) in England. Professor John Baldwin of Cambridge University has recently produced the first 'fringes' using two mirrors of the telescope.

He said interferometry in optical wavelengths requires everything to be a million times more precise than in the radio wavelengths which pioneered the technique and the necessary control systems have only recently become possible.

COAST will next use three, and then four mirrors, to produce detailed pictures of stars with the magnification of an imaginary optical mirror 100 metres across.

Professor Baldwin expects stars will not look like perfect spheres. The first two images coming from his instrument reveal stars which are oval-shaped and have bright spots. "Big telescopes are useless for such detailed picture," he said.

At the Lawrence Livermore Laboratory in California Dr Scot Olivier is one of a group punching lasers into the upper atmosphere where they create spots of light, two metres across, which are seen as artificial stars. The laser (built originally for separating uranium isotopes for nuclear power stations) acts like a reference beacon for the variations in light coming from real stars.

Producing similar, artificial guide stars, Dr Robert Fugate uses a different type of laser. He works for the US Air Force at its Starfire Optical Range in New Mexico where the powerful laser was developed as part of President Reagan's 'Star Wars' project for making missiles for warfare against satellites and incoming nuclear missiles.

This technology of missile guidance has been declassified and now the laser is being applied to astronomy for peaceful purposes.

Small mirrors on the telescope sense the variation in the laser beacon as it passes through the atmosphere. Signals are fed to small actuators at the back of the main mirror which change its precise shape 1,000 times per second and compensate for the distortion of light by the atmosphere.

The method is being used to resolve enough detail in the images of stars (a 15-times improvement over standard optics has been achieved) that, for the first time, discs have been seen around some young stars which are somewhat like the rings around our planetary neighbour, Saturn.

Developments are being funded by NASA's TOPS project (Towards Other Planetary Systems) which demands finely detailed images of individual stars. The next stage is to search for planetary systems like our own Solar System deep in space.

With previously unobtainable detail now becoming available in both optical and radio wavelengths, the latest techniques are opening up a new age of discovery about the universe. ●

Australia's economic pros and woes and its position in Asia inspire increasingly heated debate. Barry Jones, John Spooner and Wilson da Silva enter the fray.

DIVING INTO THE WORLD POOL

BARRY JONES

Innovation is extremely ambiguous to Australians. While we adopt other people's innovations very rapidly, we seem to have both an institutional and psychological resistance to adopting our own and projecting them to the world.

Barry Jones' last column for 21•C was on value-added exports.

Australia has a strong research and development base making a significant contribution to the world pool of science and technology – and companies in Australia then tap into the international pool – but the links between Australian research and Australian companies (locally owned, that is) are, at best, only vestigal.

In the 1950s Australia had one of the world's highest living standards, with a handsome trade surplus, because its export capability met world needs of the time.

In 1950 agriculture accounted for 42 per cent of world trade and minerals for 13 per cent. By 1986 agriculture had fallen to eight per cent while minerals had risen to 17 per cent. The total figure in 1992 will probably be less than 20 per cent.

Until very recently Australia was still concentrating on 1950s exports. It bought 1990s products from Japan, Europe and the United States and tried to pay for them with 1950s exports. These 1990s imports were generally high added value brand-name goods, with a high intellectual input (design, engineering, research, fabrication). The 1950s exports with which Australia hoped to pay for imports were generally low in added value: raw material or food exported in the rawest state.

In 1945 Australia had the potential to become an innovation-based economy, with skills (forced by necessity during World War II) in aviation, motor manufacturing, optics, scientific equipment, and, soon after, space, computing and transistors. The country then threw those advantages away with both hands and returned to resources. After World War II, Australian manufacturing was aimed at the local market alone, protected by high tariffs, while exporting raw materials, generally at high prices, to meet unprecedented demand in the era of post-war development. The wartime industries were dismantled. This policy, which had strong bipartisan support (including industry and the trade unions) seemed a highly successful formula for national wealth, and it was, at least while commodity prices were high and rising. With the contraction of commodities as a share of world trade, Australia was in jeopardy as a trading nation.

Nineteen fifty-seven has been identified as a turning point in world economic history – the year in which the total exports of manufactured goods, world-wide, exceeded for the first time the value of commodity exports.

It was a long time before Australia recognised the fact, probably about 1972.

The dramatic rise of manufacturing as the dominant factor in exports presented an enormous challenge to Australia, complicated by a succession of Australian governments and industries taking so many years before noticing the change. In this ignorance Australia witnessed the declining share of world commodity trade as a temporary aberration, soon to be overcome, and that normality would be restored. It hasn't happened and it won't.

After this decline had been going on for about 30 years, wiseheads in Canberra started to say: "This is beginning to look like a trend."!

Nineteen ninety-two was the turning point in Australia's economic history: for the first time exports from manufacturing exceeded the value of commodity exports. It may have taken 35 years to catch up with the rest of the world, but finally we are going in the right direction.

1992 was the turning point in Australia's economic history: for the first time exports from manufacturing exceeded the value of commodity exports. It may have taken 35 years to catch up with the rest of the world, but finally we are going in the right direction.

ILLUSTRATION BY JOHN SPOONER

NEXT

A GOANNA IN TIGERLAND

WILSON DA SILVA

Here's a little guessing game you can try at a party: What country am I? I have an economy about as big as that of all the ASEAN nations combined. I run bigger trade surpluses than most of the 'Asian Tiger' economies and two-thirds of my trade is with my Asian neighbours. I have the lowest inflation rate in the world and am growing faster than any of the rich OECD nations. Most people are quite surprised to hear that the answer is – Australia.

Wilson da Silva's last column for 21•C *was on* The Rise and Fall of the Third Chimpanzee.

We are more accustomed to hearing that Australia is being left behind in the backwash of Asia's explosive push forward, that our creaking and moribund economy has to modernise and look outward to Asia to survive. This is hammered home in newspaper columns, radio talkback shows and television current affairs programmes. One can be forgiven for slowly but surely developing the impression that Australia is little more than an Euro-centric economic backwater out of place in the dynamism of Asia, hopelessly out of step with the world's fastest growing region, never to be anything but knee-high to its neighbouring economic behemoths.

Yet Australia is, in fact, an overlooked Asian giant. It is the region's third-largest economy after Japan and China. Australia ain't small fry and, despite the doomsayers, is not about to sink under the weight of collapsing tariff walls.

Australia has changed radically since the halcyon days when it was a resource and agriculturally rich nation hiding behind tariff barriers. By the early 1970s, these had created an Australian economy colourfully described by Prime Minister Paul Keating as "an industrial museum".

Today, nine of Australia's 10 largest markets are in Asia and the Pacific, and exports of services and manufactured goods have tripled over the last decade. In 1991, Australia for the first time exported more manufactured products than rural products.

Keating would like Australia to believe that all this has occurred in the last decade. But in truth, it can be traced back to Prime Ministers Gough Whitlam and Malcolm Fraser in the '70s, and there were even murmurings during Robert Menzies' days in the 1960s. Bob Hawke also pushed the 'emeshing' of Australia into the region. To his credit, Keating raised the issue to a much more prominent position on the national agenda. In speech after speech since taking office, he has been evangelic about Australia's Asian identity, forcing the discussion onto the front pages and prompting debate about the nation's cultural psyche. He has been joined by businessmen, unionists, academics and economists who stress Australia's economic future is in Asia.

But in part they are describing what has already taken place. Although surveys show Australians still consider themselves culturally distinct from Asia, Australia has for the past few years – almost without realising it – become a big-time Asian player.

Australian-built ferries take passengers up the Pearl River to Guangdong in China, Australian-made cellular telephones are assembled in Malaysia for the Asian market and Singaporeans happily snack on mountains of Australian confectionery a year.

Australia's economy, as measured by gross domestic product, was $US294.40 billion in 1990, only slightly smaller than the combined GDP of $US312.58 billion for the Association of South East Asian Nations. Asia accounts for 67 per cent of Australia's external trade, while the traditional markets of Western Europe and North America represent only 13 and eight per cent respectively.

Japan is Australia's biggest market. Trade between Asia's industrial colossus and Australia totalled $US18.05 billion in 1991, with Australia racking up a $US4.6 billion surplus. This is the sort of trade balance the United States can only salivate over – it runs an annual $US40 billion trade deficit with Tokyo.

Australian exports to Hong Kong soared 45 per cent in 1991 to $US1.9 billion, and 250 Australian companies operate there. The territory last year became Australia's biggest source of migrants.

It is true that much of this Asian success has taken place in the past decade as our economy has globalised and local companies have pushed into Asia. Since 1987, exports have soared 42 per cent to $US40 billion.

In fact, Australia has exported more than it has imported for most of the past two years – in 1991, exports were $US3.12 billion ahead of imports. Keating is fond of telling luncheoning business people that Australia runs a stronger trading balance than economies like Singapore, South Korea, Thailand and Malaysia. He has no doubt our future is tied to the region and that a revolution, which began quietly in the late 1960s, cannot be turned back.

"There has been a revolution in our thinking and an irreversible re-casting of our economy," Keating told an Australia Day luncheon in Sydney. "It is an effort to make an historic shift to Asia and the Pacific. All this means transforming ourselves – our habits of mind and work, the way we see ourselves and the way we see the rest of the world. It will require a mature sense of identity."

However, Australia does have serious problems. One is the lack of capital – it is resource rich but capital poor, and thus forced to import boatloads of other people's money to finance development. Hence, despite having a trade surplus, when you count the $A150 billion foreign debt, Australia runs rather huge monthly current account deficits – and will likely do so for a very long time.

But changes have been taking place for some time.

Economists such as Richard Braddock, head of economics at Sydney's Macquarie University, call Australia the most Asian of European countries. Looking through the figures, peering through the charts and crunching the statistics helps water down the 'white trash of Asia' myth which has been progressively seeping into the psyche of a recession-weary nation.

Braddock stated last year: "We are, in trade and investment, an Asian country, but only recently has this been accompanied by a gradual cultural realisation."

And therein lies the source of all the debate about Australia's Asian destiny.

Economically, the nation is already heavily intertwined with the region. But this has slowly, quietly crept up on it. Only recently has it woken up to find that, hey, Australia actually does live in Asia and does business with the economic dragons to its north. What's more, Australians are swamping Thai restaurants, studying Bahasa Indonesia, practising yoga and tai-chi, eating sushi and singing in karaoke bars. Three-fifths of the two million Australians who travel overseas each year now visit Asia and the Pacific.

If this realisation comes as a bit of a shock, it is more of a jolt to Asians, many of whom still see Australia as a resource-rich backwater of lazy Europeans content to live on anything that grows or can be dug out of the ground. Some even find it hard to believe Australians have ditched the White Australia policy. They would be surprised to hear that approximately 40 per cent of new immigrants are Asian and that settlers of Asian origin have almost tripled since 1981, to 716,000, or 4.1 per cent of the population. Try quoting Australian economic statistics to Asian hosts when travelling, without revealing the country being discussed – it becomes obvious that if Australia's population were Asian rather than mostly European, the country would easily be seen as a regional economic heavyweight.

Some places in Australia are more Asian than others. Northern Territory chief minister Marshall Perron likes to call Darwin Australia's Asian capital: "We've got only 16 million people to the south but 45 million to the north. Asia has the world's fastest developing economies – the rest of Australia is only now waking up to the fact. We've known it for years," he said in an interview last year. Understandable really, considering Darwin is closer to Singapore than it is to Sydney.

The Territory has worked feverishly to lay the groundwork for its Asian push, with some success. While Australia has languished in recession, the Territory's gross domestic product has grown 5.7 per cent to $US3.3 billion in the year to June 1991. It resembles an Asian Tiger economy in the way government often acts like a paternalistic big-spender, encouraging exports to the region. Exports jumped 38 per cent to $A1.9 billion in the year to June 1991, primarily to Indonesia, Japan, China, Korea and India.

Of course, Australia's economic relationship with Asia is new and needs to mature. While it trades heavily with Asia and exports much to the region, it still prefers to invest in countries with the same language or cultural background. Two-thirds of Australia's exports may go to Asia, but only 15 per cent of its total overseas investment is ploughed into the region, compared with more than 50 per cent for Anglo-Saxon countries. Managing director Hsieh Fu Hua of the Singapore-based investment bank Morgan Grenfell Asia Holdings had a point when he told an Asia-Pacific business conference in Sydney last year: "I contend that you are not in the loop. Your lack of investment makes you an outsider. Your Anglo-Saxon background inhibits you from understanding Asia better. The understanding of Asia has to go right across the board – not just at the business level, but should include all institutions: your schools, your universities your government, your political leaders and certainly your media."

What Australia is not is an economic backwater about to sink into hopeless industrial disrepair. It is a nation that revels in self-adulation as intensely as it disparages itself when times sour. The most hard-nosed capitalists overseas don't share such pessimism – many see opportunities to use the well-educated, large and developed Australian market as a gateway into Asia.

Du Pont of the US decided last year to move production of X-ray photographic products and chemicals from its Shimuzu plant in Japan to Sydney, from where it will supply all of South-east Asia. Local gloom merchants must have been stupefied to read deputy managing director Ian Dennis quoted in newspapers saying that higher wage costs and lower productivity at the company's Japanese plant had prompted the switch to Australia, an operation that was now much more efficient.

Which brings me to my point. Don't believe the doomsayers who shriek that Australia is about to careen head-first into the chasm of Third World despair, or the ageing diplomatic has-beens and pontificating commentators who demand Australia ditch its Western liberal democratic values and acquiesce to the "reality of Asia". For this, read – don't make a fuss about Indonesian human rights abuses in East Timor or the clearing by Malaysia of virgin forests in Sarawak. Under this formula, Australia can pout all it likes about Serbian militias in Bosnia-Herzegovina and about the nasty Afrikaners in South Africa, but it musn't make too much noise in Asia lest it upset the neighbours.

If Australia's population were Asian rather than mostly European, the country would easily be seen as a regional economic heavyweight.

But Asia also has to learn to accept Australia. "The reality of Asia" is that Australia *is* a part of it. Instilled with Western values, enriched by indigenous culture and enhanced by the waves of post-war immigration, Australia is one of the most multicultural nations on Earth. Asia should no more expect it to ditch its values and assimilate than Australia should expect Asia to become more Westernised.

Some acceptance appears to be seeping through. Ratih Hardjono, the Sydney-based correspondent for the Indonesian daily *Kompas*, promoting her book *White Tribe of Asia*, recently told an ABC Radio interviewer that Australia had changed much in the last 15 years, and was a much more diverse culture. "Australia is in its essence a European culture, you cannot change that. That's why Australia is a white tribe in the region. The white tribe of Asia has its roots in Europe and England but it is mixing, it is merging into Asia without losing its own identity."

Australia still has some way to go in its psychological and economic integration into the region, but Asia also needs to refashion its view of modern Australia to fit current realities. Asia has to accept what Australia is. After all, we are all going to be neighbours for quite some time to come.

NEXT BOOKS

THE TRUE AND ONLY HEAVEN
PROGRESS AND ITS CRITICS

by Christopher Lasch
W W Norton & Company,
New York/London, 1992

REVIEWED BY WILLIAM HOBSON

Progress has always seemed a double-edged sword: for every advance modern society has made, every technological innovation or increase in affluence, there is a complementary price to be paid. Among these hazards are spiritual impoverishment, or the levelling affects of democracy and mass culture. Indeed ambivalence is endemic to modern society (modernity is on endless trial, as Leszek Kolakowski described it) and the pendulum of public opinion is constantly swinging.

At the moment it is clearly the costs of progress that dominate. Not only do global recession, racism and the resurgence of nationalism indicate that the West has failed to deliver the good life for all and create a better world, there is a also a deep anxiety as to whether the harm it has done is reversible, let alone reparable. Simply put, the Earth's finite resources will not support an indefinite expansion of industrial civilisation. But if our course can no longer be called progress in any recognisable sense, then all that seems to be left is onward momentum and the fatalistic fear that we have lost control.

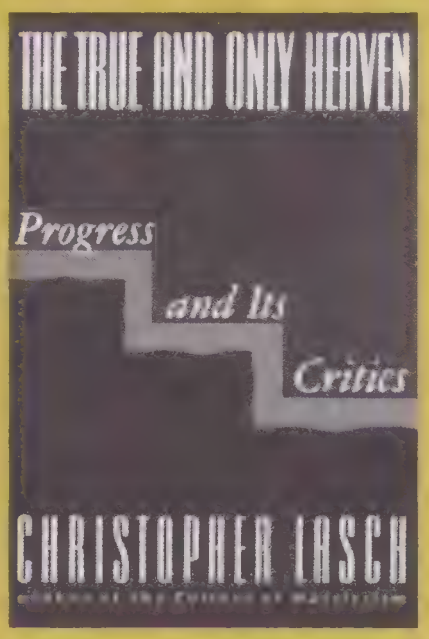
History is one way out of this vicious cycle. By investigating the origins of the theory of progress, and of modern society in general, we can hope to discover alternatives – at least an approach to our predicament that will break out of the duality of optimism and pessimism. This is the aim of *The True and Only Heaven*, the latest stage in Christopher Lasch's critique of liberalism.

His previous books, the most famous of which is *The Culture of Narcissism*, discussed the notion of authentic selfhood and the threats posed to it by the demise of the family and the erosion of private life. Modern man, he has argued, seeks the self in extremes, whereas it is rather to be found in the acceptance of limits without despair, and, in this book, he traces the origins of this misapprehension to the 18th century.

Amongst others, 18th century economist Adam Smith saw the insatiability of human desire not primarily as a source of frustration and spiritual instability, but rather as the perfect stimulus to economic development. Whatever its personal costs, self-gratification has overriding social benefits; it creates employment, generates wealth and an increasing expansion of productivity – and there is no obvious end to it. Demand can never be sated, there is no limit to the transformation of luxuries into necessities, so growth and progress need never be checked. Meanwhile the past falls far behind, seemingly irrecoverable. Nostalgia, Lasch points out, is the mirror image of this notion of progress; if history is a constantly ascending curve, then the past is cut off, the lost communities of yesteryear to which there is no return.

The justification for this unlimited expansion – the reason why it can be called 'progress' – has always been that, sooner or later, everyone will benefit both morally and materially. Standards of living will rise, as the culture of abundance spreads and, at the same time, archaic barriers and suspicions will break down as the world moves towards a universal harmony. Lasch scathingly attacks these presumptions and unthinking liberal arrogance in general; universalism is simply a misunderstanding of human nature – stretched that thin, human loyalties do not attach themselves to 'world brotherhood', they simply break – and all that's left of the liberal ideal of improvement is the consumer's relentless dissatisfaction and thirst for novelty. Progress on these principles is having nothing to protect us from what we want.

Lasch identifies an alternative sensibility predicated on the acceptance of limits, which he calls 'populist' or lower-middle class. In this, the future is faced with hope, rather than glazed over by optimism, and the past is connected to the present by memory, rather than cut off by nostalgia. People are not destined to be consumers, working only in order to be able to satisfy their wants, but producers, who work to acquire the virtues, such as independence and self-sufficiency, that labour instills. Finally, the expression of these virtues in active participation in society is prized far above the self-interest of liberalism.



The True and Only Heaven sets out to situate this sensibility in a political and moral tradition, and to portray it still at work in lower-middle class America. There is no room here to discuss all the debates Lasch has provoked. The petty-bourgeois have always been the object of liberal caricature and Lasch freely concedes their historical attraction to anti-intellectualism, racism and xenophobia. But liberal blindness to their virtues produced the backlash that brought the New Right to power – ironically, since they are just as committed to indefinite economic expansion. Reagan was the quintessential nostalgic optimist, wanting to welcome everybody into the American dream – part and parcel of which was the return of Christ and the impending armageddon.

The great strength of Lasch's book is as an analysis of the progressive mentality and the 'baffling drift' that seems to dog all political debate about the future: the simple fact is that both 'liberals' and 'conservatives' have the same belief in progress. Where it is much more contentious is in using 'populism' as a concrete political alternative, rather than just a theoretical model. The exercise of civic virtue, for instance, in practice often conflicts with individual's rights and it is highly dubious that these conflicts would be resolved without intervention by the legislature that some would say is as much the core of liberalism as progress. Nonetheless Lasch undoubtedly provokes thought, in a way apocalyptic literature notoriously fails to do.

BUSHLAND ON FARMS

by Rob and Steve Davidson,
AGPS, Canberra, 1992.

REVIEWED BY ROB YOUL

One of the pioneers who first highlighted the practical, economic advantages of retaining, or re-establishing, native vegetation on farms has written an easy and informative text on the subject.

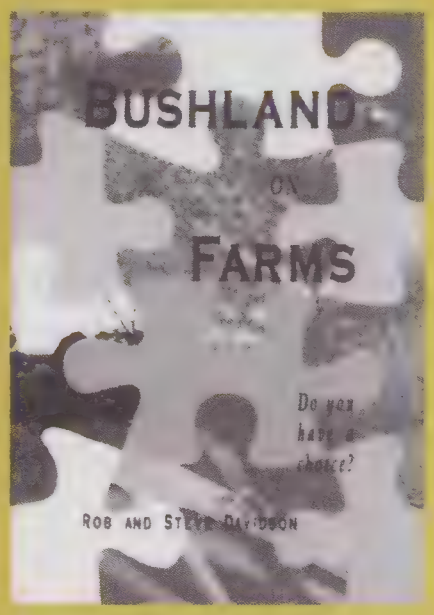
Before 1980 many experts in landcare didn't appreciate the significance of native revegetation in playing host to 'white knight' insects which prey on crop and pasture-ravaging pests. But at a national conference for those concerned about 'dieback' – the death of native trees and shrubs on farmland, and how it might be reversed – Dr Rob Davidson of CSIRO's Armidale office gave what proved to be a messianic message. If there is no bush within 200 metres, or no summer-flowering trees or shrubs, then there will be no thynnids or flower wasps to help control that most serious pasture pest – scarab beetles.

This wasp preys on grubs of at least five scarab species, helping the grazier greatly.

But what must the grazier do in return? Protect the bush. The male wasp needs sources of nectar within 200 metres (the limit of its flight) of pasture. The main natural sources are bushland remnants. If the bush has

reasonable understorey, there will be abundant nectar in spring and early summer. Less native plants flower in late summer, but one is outstanding: *Bursaria spinosa* (hence 'Christmas bush').

Many tree extension people seized upon this marvellous and graphic reason to foster and recreate native bush – free pest 'cleansing' – and featured it in innumerable talks in country halls, city schools, Rotary clubs and under red gums at field days over the next decade. It must have stimulated the establishment of a billion bursarias at least – for this hitherto unsung (but not unattractive) species is a feature of most eastern Australian nursery and seedbank lists today.



Furthermore it was a great argument for mixing trees and shrubs in a shelterbelt rather than having a boring monoculture.

Bushland on Farms builds on Rob Davidson's thynnid biography. He writes delightfully of the myriad ways insects, arachnids, water creatures, birds, mammals and reptiles dispose of pasture pests thereby increasing fodder for stock and consequent farm returns. Setting the story in his adopted heartland – the new England plateau – he recounts with grace and pleasure, intimate environmental observations made on his own block of bush and grassland.

Management advice abounds, as do figures and photographs, but the essence is: maximise natural pest control by fencing bush to maintain the understorey and the litter layer, and when revegetating, try to establish diverse 'ecosystems' in corridors across your farm.

The Davidsons' sensible and practical text precedes seven accounts from all over Australia of enlightened rural landowners who protect their bush and are generous hosts to many visitors seeking inspiration and education.

An encouraging book which necessarily fills a gap, it is good to see this pioneer revegetator still hard at work with his literary son, dispensing excellent advice.

VISIONS FOR THE 21ST CENTURY

by Sheila Moorecroft (ed.), Adamantine Press, London, 1992.

REVIEWED BY RICK SLAUGHTER

London-based publishing house Adamantine Press has seen the potential for a series of futures books with the collective title of 21st Century Studies, and looks set to dominate this under-developed market niche for some time to come.

Visions for the 21st Century, is one of the first products of the new series. It is an original anthology of 21 short pieces by a diverse, international group of writers. One of the strengths of the book is that there is no 'party line'; the essays are written from varying points of view, yet the text is remarkably cohesive. Anyone who had succumbed to the standard view of the 'future as nightmare', may well be surprised at how consistently these writers explore the grounds of informed optimism.

Sheila Moorcroft has ensured that by approaching the subject in a pluralistic, non-ideological manner, *Visions for the 21st Century* exerts a powerful impact. The richness of the futures enterprise permeates these pages, capturing the reader almost unawares. This is rare, but not surprising – it *is* a seductive enterprise; the book and the field.

In an early chapter, 'The future without end', W. Warren Wager provides a succinct and convincing rationale for futures study as an ethical concern. He writes, people who "take time seriously... will also take their lives more seriously. Placing their lives in a temporal context, they will act more responsibly, more conservingly, more caringly, with more reverence not only for the past but for the future too". Next, Ervin Laszlo outlines aspects of a new world in 'Dimensions of of a New World Order'. He includes "an holistic alliance" (i.e. moving beyond reductionist science) and what he calls "a culture of interexistence". In another strong chapter, Suter discusses the "declining utility of war" and outlines some excellent (though under-utilised) strategies for "waging peace".

Vaclav Havel's 'Our shared responsibility for Future democracy' looks precient in the light of events in Eastern Europe. He argues for urgent investment in a political culture. Equally, the piece by Crown Prince El-Hassan of Jordan, 'The Future of the Middle East', shows evidence of a possible shift in thinking which has considerable ramifications for the intractable conflicts of the region. In part it is a shift toward sustainability and long-term thinking. On the other hand, Noriko Hama, a Japanese economist, presents a striking critique of 20th century economics based on "management and control". She argues in 'The 21st century from an economic perspective', that "the freer manifestation of market forces...will inevitably lead to chaos", but then goes on to argue that chaos is not necessarily a bad thing if it leads to greater creativity!

After some more lightweight chapters, the book picks up and ends with several pieces packed with ideas. Ziauddie Sardar in 'When the pendulum comes to rest' reflects upon the contradictions of post-modernism from a coffee shop in Malaysia, and then looks forward to a time of true multi-culturalism. A.J. Dakin's 'A future from within' considers some of the defects in Western ways of thought and argues the case for acting proactively, before disasters strike. The key point is that "when a right relationship is re-established between people, culture and technology, a whole new world of options emerges". Elisabet Sahtouris builds on this in 'The brink of maturity: towards a scientific myth of our time' by considering aspects of science and mythology, concluding that "indigenous science, in conjunction with sacred practice, is not aimed at 'progress' but at 'right living'." With such a shift in pace new guiding myths would emerge.

There are two strong chapters by Willis Harman and by James Ogilvy, two atypical American futurists in that they both pay close attention to the culturally-mediated processes through which social reality is constructed. By bringing some clear and incisive thinking to bear on this oft-hidden 'layer' of understanding, they offer some fascinating insights. Harman's 'The second scientific revolution' shows how the emerging picture of reality prefigures what he calls a "second scientific revolution". The latter involves "a shift toward a view in which the universe is fundamentally alive and imbued with purpose; understanding comes from both 'inner' and 'outer' experience; and our relationship to the whole is one of deep involvement and co-creation". This is a far cry from the cynicism of late industrialism and the rootlessness of post-modernism. Nor is it a 'cry in the dark', as readers of Paul Davies' book *The Mind of God*, will attest.

Ogilvy's 'Earth might be fair' explores some of the emerging ideas which underpin a more intellectually and humanly viable approach to futures. He argues that the problems we are facing cannot be solved by science and technology. Instead, "they are human problems that call for a degree of social invention that we have not seen since the creation of democracy and the writing of the Constitution". For Ogilvy, the keys to the future are found through awareness, intelligence and creativity. He concludes that "we must just use our imaginations to spin out better ways to play."

The range of ideas addressed in *Visions for the 21st Century* is wide. Yet the overall impression is surprisingly coherent. These writers reveal a growing common view about the underlying causes of world problems and the grounds for their solution. As such the book will be of great interest to a wide audience, including students. It is a fine, readable introduction to some of the most challenging aspects of the study of futures.

Contrary to her subtitle, these insights will not take us to "Life Beyond Economics" but to a multi-dimensioned responsibility that places the formalisation (dollarisation) of value into a context accessible to, at least, a large minority of us rather than retaining it as the exclusive domain of politicians and formally trained and employed economists. Again however, to point up another inconsistency, re-empowering people with the levers to their own economy would mean reasserting popular control over much of production and its infrastructure. This in turn would mean recognising the potential inherent in so much hi-tech infrastructure to sabotage popular control. Henderson alludes to this, yet, in common with many social theorists, she remains a technological optimist, somehow unable to see the profoundly disenfranchising potential of technology released without broad societal capacity to be responsible for it. Who among our readers understands the social expectations that enable us to ride bicycles let alone to generate what we like to call artificial intelligence?

NEXT

LIMITS TO GIRTH

DAVID DALE

Revolutions by the peasants of the world have occurred for a long time now, generally with justice on their side. But their latest revolution could have devastating effects on the health of the entire planet. This time, the peasants want to overthrow their traditional way of eating.

David Dale's last column for 21•C *was on the sincere '90s.*

This change is happening just as gourmets in America and Britain and Australia are falling in love with peasant food. We seek out restaurants that offer us garlic and olive oil and lentils and peppers and chunky bread. Meanwhile, around the Mediterranean, the Middle East and Asia – the countries where such food originated – the peasants are turning to a diet high in animal fats, sugar and salt. Their television commercials suggest that this will make them more like rich Americans, and they are right, in the sense that it will make them far more prone to heart disease and bowel cancer.

As the peasants become more Americanised, the farming and cooking styles that once extended their life-spans will disappear from the Earth. And so will the forests, as pastures are created for the extra cattle needed to satisfy the meat craving of these upwardly mobile eaters.

This was the gloomy picture painted late last year at a conference in Spain called Food, Culture and Discovery, attended by 100 of the world's experts in gastronomy, plus assorted cookbook authors and journalists. One country after another contributed data showing the same pattern: the decline of the so-called Mediterranean diet and a simultaneous rise in heart disease and cancers.

Corby Kummer, a senior editor at the *Atlantic*, had researched the conference's host country: Spain. He discovered that since the mid 1960s, there had been a 45 per cent drop in the consumption of pulses – beans, lentils and chick peas – and a 200 per cent rise in meat consumption. It was, he said, the result of post-war affluence. Grains and pulses are unfashionable because they are associated with poverty. He demanded facetiously that "populations should be forced by law to eat the food of their grandfathers so that tourism will be more interesting for us".

It seems to be too late for that. Greece is even further along the road to dietary ruin than Spain. Aglaia Kremezi, author of the *Foods of Greece*, quoted a study done in 1948 of the typical eating pattern on the island of Crete: olives, cereal grains, pulses, wild greens, potatoes, and fruits, with limited quantities of goat meat, cheese and milk, a little game, and fish.

"This had been the basic food for 40 centuries," she pointed out. "No meal was considered complete without bread, which had a symbolic value: as a wife completed the shaping of a loaf, she might cross herself and make a cross on the bottom of the loaf. Spilling wine, of which there was plenty, meant good luck. Olive oil contributed heavily to the energy intake. To foreign visitors, food seemed to be literally swimming in oil – used as a cooking medium in preference to animal fats, and a dressing for salad, and it was added to soups and cooked vegetables. And this was the period when the rate of cardiovascular disease in Greece was among the lowest in the world."

But that's all over now. Kremezi described her country in the '90s: "As we became more prosperous we felt that we had to wipe out the vestiges of our difficult past. Our bread was kneaded, and the lively hand-woven curtains and blankets, were sold to travelling merchants for a song, to be replaced by plastic tableware and aluminium kitchenware.

"Our cooking, especially in Athenian homes and restaurants, is more or less insipid, neither European nor eastern. Souvlaki, hamburgers, veal or pork chops, spaghetti and pizza are the dishes one is likely to find everywhere, often together with badly cooked vegetables. Every time that by chance we happen to taste something original in a small island tavern or in a village in northern Greece, we are pleasantly surprised, but the people who cook these dishes do not think much of them and make excuses for not having something better to offer because they consider the regional specialities unworthy of our attention."

Marion Nestle, professor of nutrition at New York University said the centre-piece of the ideal American meal is beef, topped off with dairy products, and that assumption is infectious. She quoted a poll taken in 1992 in which Americans were asked to describe their favourite meal. It went like this: "a shrimp cocktail or other seafood appetiser, a green salad, vegetable soup, steak with potatoes and broccoli, cheesecake or ice-cream for dessert".

"Meat is a marker of economic class," said Professor Nestle. "As poor people raised on plant-based diets do better, either at home or as immigrants in a new land, they eat more meat. Once you put meat in front of people, they don't look back. In the rush to assimilate, immigrants to the US rejected the spaghetti, rice and other traditional sources

"It's a moot point whether meat will kill us first or the plan we live on. My bet is the planet One-third of South America's forests have gone since the ear 1960s, while the land in pasture cattle has climbed by 50 per ce Colin Spencer, food columnist f *The Guardian*.

of calories as 'foreign' and inappropriate in a new land."

Colin Spencer, food columnist for the *Guardian* and author of *Vegetable Pleasures*, said total meat consumption is rising rapidly around the world because factory farming is becoming ever more efficient. The planet now supports 11 billion meat animals. "The great danger in these amounts of livestock is the ecological cost," said Spencer. "It's a moot point whether meat will kill us first or the planet we live on. My bet is the planet. One-third of South America's forests have gone since the early 1960s, while the land in pasture for cattle has climbed by 50 per cent.

"Ruminant animals release eight million tons of methane gases a year in belches and farts. Forests teeming with rare forms of plant and animal life are cut down, water tables fall and are polluted with fertilisers, lakes and rivers are choked with algae, green pastures turn to desert, the ozone hole grows even bigger – all because we want to eat beef and have a plentiful supply of dairy products."

Spencer wondered why we have such a fixed belief that meat is essential, when the medical evidence shows we can get the same benefits from other foods. It's embedded deeply into our culture, he suggests, right back to the Biblical proposition that the beasts of the field were put there for man to eat, and the story that when Cain brought vegetables as an offering, God was angry, but when Abel brought meat, God was delighted.

There's also the primitive urge to feel that we are hunters and conquerors. "Meat today has very little flavour, but the texture of torn, cooked muscles is unique, and vegetables cannot replicate it," said Spencer. "I think this texture on the palate and between the teeth gives a deep atavistic satisfaction."

Spencer wants us to overcome these ancient urges and aim for a diet of "wholemeal breads and cereals such as millet or couscous, fresh herbs, dried pulses, vegetables and fruit, fish cooked simply, and lashings of olive oil and garlic. Who needs meat when we have so much?"

Corby Kummer is not entirely pessimistic about the way the world is eating. He sees good omens in the fact that many affluent Americans have started "paying a fortune to eat like poor people – we'll pay $30 a litre for unfiltered, unprocessed olive oil; we look for native American beans, and Italian-style bread with stone ground whole wheat flour baked in wood fired ovens. The influential trend-setting class is turning away from meat. For Americans this isn't a return to anything we knew, it's a rejection of the food our parents bought us, with all that fat."

So if the American meat obsession of the 1950s is now causing pork and beef craving among the upwardly mobile Mediterraneans, Middle Easterners and Asians, perhaps there will be an equal American-influenced passion for vegetables in 20 years. But will it happen in time to save the forests? And anyway, by the year 2010, will there be any peasants left to show us the way back to health and fun with our food?

Three of the world's largest chemical companies are on a mission to find a replacement for the ozone depleting CFC. But as Gib Wettenhall reports not everyone is convinced it has been discovered.

plugging the ozone hole

The race to find substitutes for ozone-depleting chemicals is over, claims the chief research scientist of one of the world's largest chemical companies, Du Pont. But according to a leading environmental scientist with the Australian Conservation Foundation (ACF), the race has just begun. And, the ACF adds, if we continue to compound past errors by relying, once again, on artificial substitutes, then the only race which might be over is the human.

Over the last year, three major chemical companies – Du Pont in the United States, ICI in Australia, and Asahi Glass in Japan – have all registered patents in different processes for producing a chemically engineered substitute to the current crop of chlorofluorocarbons (CFCs). A member of the fluorocarbon family itself, the substitute has been hailed by industry as having zero ozone-depleting ability and only a slight global warming potential.

Now comes the hard part, however: persuading money-conscious manufacturers and a sceptical public to make the switch to this new substitute for CFC. We've made it, now we have to market it: is the argument promoted by Du Pont's Dr Leo Manzer, a guest speaker at the recent five yearly gabfest hosted by the Royal Australian Chemical Institute. "As far as I'm concerned, the technology is there, the plants are being built, the products will be available for people to make the transition away from CFCs on time, provided people are willing to do so and the governments make it happen," Dr Manzer told *21•C*.

But why should we believe chemical industry representatives such as Dr Manzer? asks the ACF's Dr Mark Diesendorf, a former CSIRO research scientist. "They are representatives from the principal companies producing chemicals which are destroying the ozone layer," he asserts. "With their new creations they are simply trying to retain control of the market for CFC substitutes."

As Ian Prince, the former environmental affairs manager for ICI, readily acknowledges there's a big prize at the end of the day for those who come up with viable substitutes. The market in CFC replacement costs alone is estimated at $200 billion. As for new markets: imagine all those developing Third World households who can't wait to buy a fridge or airconditioner.

BILLION DOLLAR MUSCLE

Seeking CFC substitutes has involved a massive effort and a billion dollar plus expenditure by the world's major chemical companies over the five years since the signing of the Montreal Protocol, the United Nations sponsored agreement originally aimed at phasing out ozone-depleting chemicals by the year 2000. With world-wide alarm growing at the damage being wrought by CFCs on the ozone layer, a UN sponsored meeting at Copenhagen last year brought the phase-out deadline back to the end of 1995 for developed countries with an extra 10 year grace period for developing countries.

"This has been a Manhattan-type project," Dr Manzer enthuses, alluding to the vast scale and unique degree of co-operation during World War II between United States scientists in the race to crack the secrets of the atomic bomb. "Once we'd made the commitment to go after the best technology to make CFC alternatives, we threw everything we had at it. In the 20 years I've been with the company, I've never seen Du Pont muscle put to work in such a manner."

Du Pont has a lot of muscle. At the experimental station in Wilmington, Delaware, where all the long range research is done for Du Pont, Dr Manzer manages 4,000 employees, 1,500 of whom are Ph.D. scientists. Accounting for 30 per cent of Du Pont's research and development, the experimental station had an annual budget of over $US400 million last year. From March, 1988, a major part of this 'muscle' was shifted into the global race for CFC substitutes.

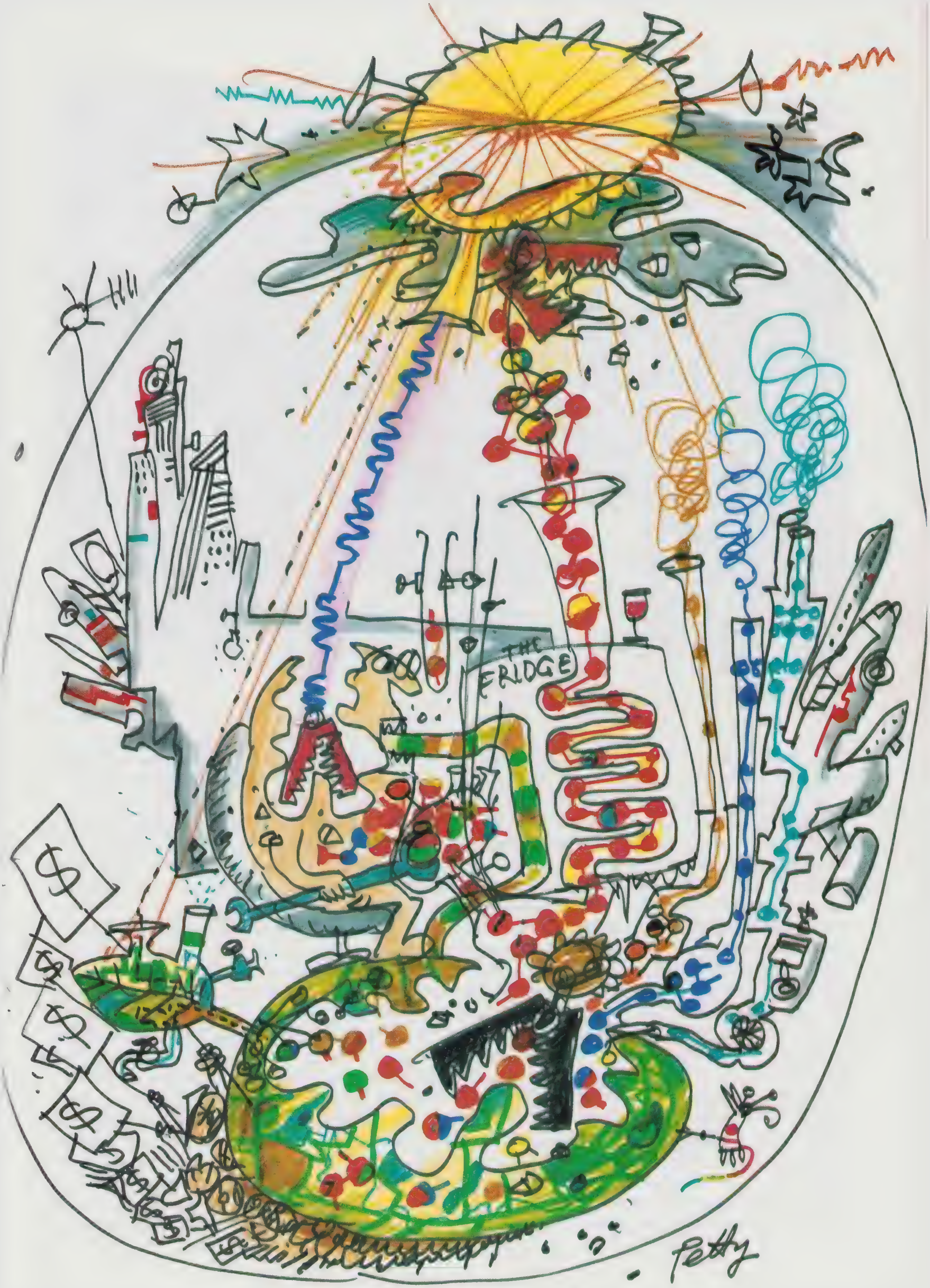
Dr Diesendorf wishes some of Du Pont's muscle had been diverted into engineering the problems out of existing natural CFC substitutes, such as ammonia, propane and even water. "We believe CFCs are not the way to go," he says. "None of these alternatives are being looked at seriously because the chemical companies can't make big bucks out of them."

EVIL GENIES

Once upon a time there was only one route for making CFCs, the genie hidden inside the coolant for refrigerators and air conditioning systems, the solvents for cleaning computers and electronic clocks, and even found as the foaming agent inside the walls of styrofoam cups. Alternatives weren't considered when CFCs were seen as little short of miraculous: inexpensive to produce, odourless and non-toxic to animal species.

It wasn't until 1985 when the ozone hole appeared that scientists dis-

Imagine all those developing third world households who can't wait to buy a fridge or airconditioner.....


THE FRIDGE
petty

covered this cheap little genie had a nasty side: the two forms of CFCs manufactured had been silently munching away at the Earth's protective ozone layer for the last 50 years. With atmospheric lifetimes of more than 100 years, CFCs slowly break down, generating chlorine radicals which begin a catalytic reaction attacking ozone molecules. No ozone means no protection from deadly ultra-violet rays and that means no human life on Earth. It is not surprising, therefore, that environmentalists are wary of fluorocarbon substitutes. Using what Dr Diesendorf describes as their "microscopic resources" the ACF and RMIT's Key Centre of Design have launched a Green Fridge Quest, searching world-wide for an energy-efficient fridge design based on naturally occurring chemical substances such as water vapour or propane.

The London Polytechnic has already built a prototype fridge running on propane. A pure version of LPG gas, propane is widely available at a fraction of the cost of fluorocarbon products: 50 cents per kilogram compared with $70 per kilogram for the new CFC substitute, estimates Dr Diesendorf.

But the amount of fluorocarbon used per fridge will still only amount to a few dollars, Dr Manzer retorts, and, unlike propane, the new substitute is not highly flammable. "If the propane leaks, and there's a pilot light on the stove, the fridge will blow up and someone will get killed. So many environmental groups at talks that I give say: 'So you're only going to kill X number of people a year – that's an acceptable risk!'. We don't need to take that risk. We're not going to put a flammable material in if there's a hazard."

Taking on board the logic of this argument, why do we all drive cars, Dr Diesendorf asks? "We're sitting on top of a petrol bomb. At least with a fridge there are no moving parts," he says. "We should be able to engineer a propane fridge which is even safer than the motor car."

DO WE LOVE TO USE CFCs?

One of the first research actions undertaken by Du Pont in their search for CFC substitutes was to survey which markets really require fluorocarbon products. "It became pretty clear to us that industry and society had pretty much wasted a lot of CFCs," Dr Manzer states. "You know, they were cheap, you throw them away. Conservation was non-existent. To such an extent that we believe that 50-60 per cent of the future market for CFCs can be reduced through the introduction of waste conservation measures."

As Dr Manzer explains there were also whole markets unnecessarily using CFCs for various applications such as "blowing foams where you don't require high insulating properties – in styrofoam cups, cigarette filters or foam cushions so you've got nice, soft seats to sit on. There's a whole market which can switch over to using a material such as carbon dioxide to blow foams, instead of CFCs. You can use water and organic-based materials to clean a lot of electronic components, drills and bits. You don't have to use CFCs."

That leaves about 30 per cent of the market, Dr Manzer estimates, with applications for which nothing but fluorine-containing products work – as yet. "That doesn't mean that we're not continuing to look," Dr Manzer says. "We're out of business if the next guy comes up with something that is more environmentally acceptable."

THE PERFECT SOLUTION?

It has not proven easy to find fluorocarbon substitutes for CFCs. "The biggest problem is that you have to find products that will work within this incredibly fast moving timetable," Dr Manzer says.

To begin with, there are approximately 340 chlorine-fluorine-hydrogen containing materials, but only a single route, a single chemistry had been used in the past. "It was all unknown chemistry," Dr Manzer said. "We had to jump in and evaluate the different physical properties of hundreds of different compounds."

Usually it takes 10-15 years from testing a chemical to construction of a commercial plant. In the race to beat the collapsing time scale, the chemical industry took on board two innovations in approach. For the first time the companies took the huge risk of building pilot plants to produce 'best-guess' compounds before all the laboratory solutions and data were in. Du Pont spent $US400 million constructing 14 pilot and

Collection Dorothy Frei

'I See 3 (Saint Veronica with hole in ozone layer)' 1989. One of a series of paintings by the Australian artist Geoff Lowe incorporating the ozone hole with other elements including Tower Hill.

Alarm bells began sounding in 1987 when NASA flew a modified U2 aircraft from Chile and criss-crossed Antarctica measuring levels of Chlorine monoxide (ClO). They found that as the ozone depleted, ClO increased; providing strong evidence that the chlorine from CFCs is escaping into the atmosphere. It will be at least five years before the stratosphere could compensate and changes would be noted if we stopped using CFCs. If the Montreal protocol is adhered to the ozone hole is expected to disappear by mid-next century.
The larger diagram (left) shows the first break-up of ozone caused by the release of chlorine during the polar dawn as the sun's UV rays release the chlorine into the stratosphere. The smaller diagrams show the ozone hole three times the area of Australia changing shape and moving around, encroaching over Chile (top right of circle) on October 4. Australia is seen at bottom left. (NASA Goddard Space Flight Centre)

commercial plants. All up transition costs are projected at $US1 billion.

"It was one heck of a great risk, knowing full well that you're probably going to have to make changes in the design somewhere along the line," says Dr Manzer. "We ran into a lot of problems, and it cost us a lot of money to fix those problems in the plants, as we were starting them up. I mean, that's not the time to change your design and your plants." The financial risks might have been high but, so far, the gamble appears to have paid off.

Along with ICI and Asahi Glass, Du Pont has found one key fluorocarbon compound, known in the trade as 134A, that satisfies all the criteria for CFC substitution. Generations of laboratory rats were exposed to suffocatingly high concentrations of 134A, suffering only minor toxic side-effects. In the four major areas of flammability, toxicity, greenhouse and ozone depletion, 134A passed United Nations Environment Programme set tests with flying colours.

Lacking chlorine, 134A appears to have no impact on the ozone layer and only a small global warming potential as a result of its infra-red absorption capacity – that is, its ability to absorb and hold energy, instead of letting it escape from the atmosphere. It appears the perfect solution.

But appearances, as the old saying goes, can be all too deceptive, Dr Diesendorf warns. Miners used to take the white flakes of asbestos home at christmas time as an artificial 'snow' for the family christmas tree. As an aid to the quest for beauty, doctors – until recently – pronounced silicon breast implants as perfectly safe.

"Toxicity cannot be resolved over such a short time-frame," he asserts. "You need somewhere between 10 to 20 years to carry out the vast number of experiments over the huge range of combinations." He adds that the real problems lie with a chemical's degradation over time and how the resulting breakdown products might combine with naturally occurring compounds to produce something which is highly toxic to humans, animals or the ozone layer.

No corners were cut in the three years of rigorous testing, claims Ian Prince. The pooling of resources and toxicological testing were brought under the auspices of the United Nations Environment Programme, providing the most comprehensive testing of a chemical compound ever carried out.

A UNIQUE AGREEMENT

Out of the hundreds of different possible compounds, it was no coincidence that ICI, Asahi Glass and Du Pont chose to focus on one particular fluorocarbon, 134A. Their mutual choice was brought about by a unique agreement to co-operate as a means of finding a suitable fluorocarbon substitute in time to meet the 1995 CFC phase-out deadline.

Initial evaluation pointed to the potential of 134A. According to Dr Manzer, Du Pont began the co-operative ball rolling by contacting the other major players in the chemical industry with an open-ended offer: "We said: 'Look guys, we're going to go on this 134A. There's millions of dollars of toxicity testings to be done. If anybody else wants to share the costs, we can move things faster. It worked out really nicely: the sharing of costs to get the common data."

Whatever its perceived shortcomings, the combination of parallel product development with a co-operative, industry-wide approach has the potential to act as a model in solving other major environmental problems, believe both Ian Prince and Dr Manzer. They saw the natural extension of this model as seeking solutions to the global warming problem.

Whether these 'solutions' achieve any more environmentally sustainable goals than current industry practices still remains the critical question, says Dr Diesendorf. "We have to take a more holistic approach. Flammability, for instance, is so easily engineered out compared with reversing a compound's impact on global warming or the ozone layer."

Under the holistic approach, demand can be modified. "I personally believe that outside the tropics and the centre of Australia, air conditioning is quite unnecessary. Proper fans would serve just as well."

Another stark choice with which many Australians would disagree. Which takes us back to where this article began. ● **Gib Wettenhall's last article for *21.C* was on the Polluter Pays Programme.**

$elling the President

WITH THE FERVOUR OF TV EVANGELISTS, PRESIDENTIAL CANDIDATES ARE SELLING THEMSELVES TO THE PUBLIC VIA THE SCREEN. ALL IT TAKES IS A LITTLE CUNNING, A LITTLE CHARISMA AND A MOUNTAIN OF MONEY. MCKENZIE WARK REPORTS ON THE GROOMING OF THE PRESIDENT.

What should the Bush media campaign team have done when the president began plummeting behind in the polls? "Bomb Libya and hope we've got good video." One can only hope that Republican media consultant Stuart Stevens was joking, but given how important a role the media and the polls play in contemporary politics, you never can tell. The Bush and Clinton campaigns spent over $US90 million on the presidential campaign, and half of that was on television and radio advertising. The media has radically changed, and continues to change, American presidential politics. By looking into past trends, one gets a glimpse of how these changes will continue into the future.

The rhetoric and methods of American politics have a long history. What we see in the Bush-Clinton contest is the sum total of the innovations to media politics introduced by Roosevelt, Eisenhower, Kennedy and Reagan.

Before there was television there was radio. An incident from Roosevelt's 1944 presidential race against Thomas Dewey illustrates his genius with the medium. Roosevelt booked time for a 15 minute address on the NBC network. Dewey booked the following 15 minutes to catch Roosevelt's listeners and rebut the president's case. So Roosevelt delivered a 14 minute speech. The last minute of paid airtime was... silence. Millions of listeners turned the dial to other stations, denying Dewey the chance to exploit the president's on-air popularity.

Six years later Dewey caught up with the power of the media, and made the first effective use of television while running for governor of New York. The Republican party, then as now, has a congenial relationship with Madison Avenue's advertising industry, with which it shares a free-market philosophy. It took a long time, though, for them to see eye-to-eye on political campaigning. The BBDO advertising agency created an 18 hour 'television talkathon', with Dewey answering voters' questions live on air. This gimmick contributed perhaps 100,000 votes to Dewey's victory, according to Edwin Diamond in his classic book on TV politics, *The Spot*.

In the 1950s, the idea of mass marketing a politician started taking over from the old style of putting together coalitions of community groups. The traditional party machines were designed to filter the candidates appeal to each sectional interest through intermediaries. The new approach used mass media rather than go-betweens, and needed a message that could be all things to all potential voters. American politicians since Abraham Lincoln had tailored their pitch for each public meeting. Over the last 60 years, the mass media has changed that dramatically.

The changes came slowly at first. TV politics in the '50s mostly just put half-hour hustings' speeches on the box. In the 1952 campaign, the marketing men noticed that audiences never remembered any of the 30 campaign points in those speeches. So, employing the marketing jargon of the time, they devised the 60 second commercial spot with just one "easy to remember" idea, a 'unique selling proposition'. BBDO came up with the 'Eisenhower answers America' spots. With his glasses removed to make him look more homely, Eisenhower answered one question from a typical voter in each ad. These had to be written in giant letters on cue cards, as Eisenhower was as blind as a bat.

The Bush campaign learned the hard way that the rules of this game are changing... In seeking to establish that Clinton was flawed and thus unfit to hold office, the Republican camp had merely established that he was by contemporary standards a pretty regular kind of guy.

These spots look pretty crude today, but they brought together three elements that changed the face of politics. They were very brief, they had very broad appeal and they addressed the voter politely, but informally. Where traditional political campaigning took place in public spaces and had a public address rhetoric, the new media politics addressed people in the privacy of their own homes. The ad-men wanted their candidates to appear like a guest in the home, not a politician on a podium. As Joshua Meyro-

witz argues in *No Sense of Place* (Oxford), this gradually led to a political style of 'backstage' behaviour for the cameras, where the candidate speaks softly, as if he is talking to the viewer in the privacy of their own living room. Ronald Reagan was famous for his ability to do this. Like Roosevelt before him, Reagan was known as the 'great communicator' and was fond of delivering fireside chats.

While Roosevelt and Reagan understood the media aspect of politics brilliantly, most of the presidents and hopefuls in between have required coaching and handling. Richard Nixon tried to run his own campaign in 1960 and lost. The victor, in Edwin Diamond's words, was "youthful, bright, handsome, wealthy and relatively unknown. In short, a perfect candidate to use television." The live-to-air debate between Nixon and Kennedy made this election famous. Radio listeners polled after the broadcast generally felt that Nixon came over better, but TV viewers thought Kennedy won the day. The youthful and handsome Kennedy had taken a nap before the show, whereas Nixon had come direct from a public meeting. Kennedy looked immaculately groomed. Nixon's make-up, a preparation called Lazy-Shave, looked exactly that.

The youthful, handsome Kennedy had taken a nap before the show, whereas Nixon had come direct from some public meeting. Kennedy looked immaculately groomed. Nixon's make-up, a preparation called Lazy-Shave, looked exactly that.

In this photo-finish election, the media made the difference. Media theorists like Marshall McLuhan celebrated this new electronic democracy, while others like Vance Packard decried it. Marshall McLuhan's friend Tony Schwartz made the most famous political ad of 1964 – and of all time – for President Johnson. If the advertising agencies of the '50s were dominated by hard-sell Republican WASPs, by the '60s a more liberal and creative style was starting to emerge.

Doyle Dane Bernbach (DDB) rose to prominence using soft sell advertising with strong emotional appeal. A DDB executive brought Schwartz into a very hush-hush meeting, at which he held up a picture of Johnson. "Would you work for this product?" Schwartz said yes, and his famous daisy-chain ads were the result.

A small child pulls the petals from a daisy, counting down from 1 to 10. Cut to a mans voice over a loudspeaker, counting back down from 10 to 1, then cut to an atomic explosion. "These are the stakes," says President Johnson's voice-over. "We must love each other, or we must die." This is what Schwartz, in his book on affective advertising, calls *The Responsive Chord* (Doubleday). Given that Johnson's opponent Barry Goldwater was given to loose talk about "lobbing atomic bombs into the Kremlin" it wasn't a hard chord to pluck.

The politics of emotions became a Republican rather than a Democratic speciality during the Reagan years. In *Ronald Reagan: the Movie*, Michael Rogin argues that Reagan had the perfect training for media politics. He started as a radio sports announcer and became a competent B-movie actor and union organiser for the Screen Actors Guild. He ended his media career introducing sponsored TV shows for General Electric and promoting the virtues of their home heaters and atomic power plants. He could appeal to several generations of Americans with a repertoire of one-liners from 20 years worth of movies, from *Bridges at Toko-Ri* to *Dirty Harry*.

The Reagan administration considered media strategies to be central not only to winning elections, but to running the country. White House official Leslie Janka commented acidly: "This was a PR outfit that became President and took over the country. To the degree that the constitution forced them to do things like make a budget, run foreign policy and that, they sort of did, but their first, last and overarching activity was public relations." Michael Deaver, David Gergen and James Baker were the team who stage-managed the public image of the Reagan presidency, according to Mark Hertsgaard's *On Bended Knee* (Shocken Books). They discovered that by blocking media access to the President, his rare appearances then became a precious commodity that they could dole out to the media on their own terms, particularly when it came to photo-opportunities for the cameras. With the Democrats failing to argue a clearly alternative position on taxes, deficits, welfare or foreign wars, the media had little choice but to present the image of a conservative government far more out of step with public opinion than anyone realised at the time.

Frames from the famous 1964 'daisy countdown' Democratic advert for Johnson against Goldwater (above) and the 1988 Republican 'revolving door' advert for Reagan against Dukakis (opposite).

Stage-managed media politics also worked for Bush during the Gulf war. Las Vegas impresario Sig Rogic put on spectacular patriotic displays for the cameras. It is a tactic that, judging by the Bush defeat, is no longer working – perhaps the Republicans needed to bomb Libya or dig into the 'dirty tricks' that produced the Willie Horton ads in 1988.

Willie Horton was a convicted murderer who killed again

when released on a weekend furlough. The furlough programme had been set up in the state of Massachusetts by a Republican governor, but the Horton incident happened when Governor Michael Dukakis held office. The Horton issue was used against him in the Bush versus Dukakis Presidential campaign in extremely effective television commercials prepared by groups supposedly independent of the Bush campaign.

The Clinton media campaign was far more professionally run than its Dukakis predecessor. The problem for the Democrats was that they lacked the highly sophisticated, computerised research and direct-mail campaign technologies of the Republicans. They do, however, have Hollywood. Humphrey Bogart, Lucille Ball, Henry Fonda and Groucho Marx were among the many stars who campaigned for Roosevelt in 1940. Ironically, the Democrat lobby in Hollywood was spurred into action by MGM mogul Louis B. Mayer's attempts to press-gang his contract screenplayers into contributing to the Republican cause. Having Warren Beatty publicly support your candidacy can have its draw-backs, as Gary Hart discovered in 1988, although it didn't seem to harm Clinton.

In an era when a Senate candidate requires $US10,000 every day to run a campaign, candidates can't be too picky. Ronald Brownstein argues in *The Power and the Glitter* (Pantheon) that Hollywood power brokers like TV producer Norman Lear use their financial leverage over Democrat candidates to push them in a liberal direction. It is doubtful that the liberal influence of Hollywood money is any match for the financial contributions of the pharmaceutical industry or Wall Street. The high cost of politics ties all candidates to powerful business interests. For every dollar the labour unions contribute to Clinton, business interests contribute about four times the amount. In the case of the Ross Perot campaign, it looked more like a businessman trying to buy the Presidency direct rather than through one or other of the party franchises. Anyone looking for a good argument in favour of a ban on paid political advertising on TV need look no further than Willie Horton and Ross Perot.

Wealthy candidates buying airtime is not the same thing as buying votes. Viewers can be very cynical about political advertising. One of the most striking features of the 1992 campaign was the extent to which the candidates used the 'free' media airtime of chat shows and the news. The campaign teams put enormous effort into making sure the candidate was seen on shows that have some viewer credibility in an attempt to avoid the low impact that commercials increasingly have. The news and current affairs shows have, of course, always featured interviews with the candidates. What was new about the 1992 election season was the extent to which campaign issues were raised on shows that aren't usually about current affairs. Chat shows – which usually focus on everyday life, celebrities and moral issues – embraced the candidates. Even MTV ran election talk shows.

Increasingly, the division between the public sphere and the private sphere is being eroded by the media. This means that politics is no longer about candidates who look good on a horse, passing down main street in a parade. It is about candidates who can behave like a guest in people's homes, as seen on TV. In the early days of television, the division between public and private space was reconfigured as a division between public and private television time. Public events were for the news and current affairs shows. The rest of the programming time was about the joys and tribulations of private life.

Increasingly, the division between the public sphere and the private sphere is being eroded by the media. This means that politics is no longer about candidates who look good on a horse, passing down main street in a parade. It is about candidates who can behave like a guest in people's homes, as seen on TV.

This division was never perfect or simple. Even TV sitcoms dealt with political and public matters at times. Richard Nixon displayed a brilliant mastery of the public private divide by answering a serious allegation about accepting gifts into a monologue about his private life, culminating in the famous claim that all he ever received as a gift was a dog named Checkers. How could he give back a dog that his children loved so much?

While the personal life of the candidates has always been a matter of public scrutiny, it is only with the coming of television that the details of personal qualities became major campaign issues. The Bush campaign learned the hard way that the rules of this game are changing; they thought that by exposing the weaknesses of Clinton, voters would reject him. What they did was paint a picture of a fallible man who shared very similar faults to many of the people who might consider voting for him. What did we know about Clinton? That he likes jazz, has smoked dope, didn't agree with the Vietnam war, has cheated on his wife, who is a professional woman with a life and career of her own. In all, a thoroughly contemporary white middle class American male. In seeking to establish that Clinton was flawed and thus unfit to hold

office, the Republican camp merely established that he was by contemporary standards a pretty regular kind of guy. The same thing worked for Ronald Reagan. Reagan and Clinton survived the exposure of their failings because they accepted them with good grace. Like friends we may know and like, we accepted them as they are because they acknowledged their limitations.

The space between the public and the private has been changed by the media, especially television. First it was replaced by a division between public and private TV time slots. Now it has been replaced by an elaborate mixing of the two. This is a trend that is likely to continue. The media also have the uncanny knack of projecting images simultaneously into many different kinds of lives. People who complain about the vacuousness of political statements should consider that such statements are now *instantly* transmitted to everybody via the mass media. It is increasingly difficult to tailor statements and modes of speech for different communities. Dan Quayle fell foul of this when he attacked Murphy Brown. He was trying to make a statement about 'family values' for the conservative wing of the Republican party. The media quickly saw to it that the whole country, indeed much of the world, heard his remarks. The Murphy Brown show even responded in kind, having Murphy watch the Quayle statement as a news item in her home – fiction became fact. Both parties are obliged to make statements which avoid turning off the middle ground, yet they have to keep their radical wing in line. Politics is increasingly a problem of finding the rhetorical devices which will allow the right to articulate the centre ground, or the left to articulate the centre ground, while alienating as few voters as possible.

THE FUTURE

Future developments in TV politics are likely to continue the trends that run from Roosevelt to Clinton. Three aspects stand out: increasing diversity, perversity and speed. It may seem strange to suggest there will be more diversity. There will be increasing diversity in the channels and formats of electoral media politics, but this does not necessarily mean more diversity of views. In the Clinton-Bush race, the campaign machines learned to bypass the traditional outlets of TV news and press political reporters. Clinton played saxophone on the Arsenio Hall show and answered questions on MTV. He appeared with his wife Hillary on the cover of *People* magazine. It is a little more difficult for an incumbent president to retain his dignity and spread throughout the media. President Bush did appear on ABC's *20/20* show and CBS *This Morning*, thus setting the present line of acceptable taste in presidential appearances in the media. We can expect that line to move, however, as the political handlers continue to try to outwit the media. Presidents campaigning on so-called 'tabloid TV' and 'reality TV' can't be too far away.

Speed will also characterise campaigning in the future, as it did in the Bush-Clinton contest. When reporters don't even have to rush to the phone but can file stories instantly from their hand-held portables, we can expect an increasing amount of instant sensationalism, as journalists fight to keep ahead, or just to keep up with, the media pack.

Communications technology not only speeds up the media coverage, it breaks the link between the candidates' 'campaign trails' across the nation and the media coverage. Local television stations are making increasing use of satellite relays to record interviews with the candidates from any and every location. Many also use 'video press releases' from the candidates themselves, delivered by obliging campaign managers to the satellite feed. Some stations don't even bother to indicate the source of these promo videos when they show them.

New technology can also speed up and rationalise the campaign fund-raising effort. Candidates can now set up semi-automated '008' style phone lines to raise funds – to spend on more advertising for the phone numbers to raise more funds. On the other hand, Ross Perot promised an 'electronic democracy' – and this was a popular proposal. The American public has watched enough TV to know a con when it sees one, and the promise of an 'unfiltered' political communications process is an attractive alternative. Because of their relative novelty and lack of slickness, the appearance of candidates on chat shows is popular with TV audiences. A further decentralising of the channels of communication, including the introduction of computer network bulletin board systems, might not be far off. There are now millions of Americans who use their computer and a modem to access information and services, so the experiments of the Perot supporters with bulletin boards might be something for more experienced candidates to capitalise on in the future.

The process thus becomes a contest between the political image makers, trying to produce a new symbol or slogan every day; and the journalists, looking for a weakness, affectation or scandal to bring the candidate down.

As the process of election communications becomes faster and more decentralised, as the traditional rules of the public sphere decay, the process will also become more perverse and paradoxical, at least until new conventions and customs are worked out. In this last election, the American voter received more information than ever before. More information is, however, not the same as better information. Any whiff of scandal will bring on an insect attack of journalists, buzzing around a candidate asking prurient questions. Meanwhile, policy issues languish. Since policies tend to be fairly coherent and consistent, they are not 'news'. The process thus becomes a contest between the political image makers, trying to produce a new symbol or slogan every day; and the journalists, looking for a weakness, affectation or scandal to bring the candidate down. Meanwhile, the really exciting challenge is to use the diversity of communication channels to produce a diversity of valid and useful information. This is a challenge which in American electoral politics has yet to be met. ● **McKenzie Wark lectures in communications at**

Prime Time Prime Minister

BY RAY EDGAR

Australian political campaigning hasn't always been as lacklustre as it is these days. Once upon a time, before GST and economic rationalism, there existed politicians who understood that not everyone had a Ph.D. in economics. Menzies realised that the middle-classes felt 'forgotten'. Gough Whitlam exploited the public dissatisfaction with 23 years of conservative government, emotively arguing it was time for a change. These weren't lessons in economics or political management, these were appeals to the heart and a reinforcement of the public mood.

The only economic lesson successfully absorbed by the public this decade has been Keating's 'banana republic' speech – and that was unplanned and delivered on talkback radio. As Paul Kelly notes in *The end of certainty* the treasurer's speech was a passionate attempt to explain the parlous state of the economy. The operative word of course is passionate, a rare ingredient in today's campaign lexicon.

The 'banana republic' description was a rare moment of clarity from the man who would become prime minister. Since then Keating and Hewson have been mired in jargon, and accordingly have increasingly alienated the average voter – and viewer.

Campaign directors in the 1993 federal election realised that much of their combined $20 million advertising budgets should be spent on selling their candidate on television to the ordinary person. To do this they employed a number of techniques, often borrowed from American models.

The Liberals' 1993 campaign is ironically a throwback to Whitlam's 'It's time' appeal, but far less catchy and more American in approach. The latest 'gun sights' campaign is a striking image backed up by a weak line: "Ten years is long enough, Labor's got to go". "You can't just import American models in Australia," says ALP campaign advisor Bob McMullan. "Willie Horton ads aren't effective in Australia because of the different culture." He says the tendency to import Americans to co-ordinate Australian campaigns is a serious mistake.

Advertising is not the only propaganda at the political parties' disposal. As a recent feature on John Hewson in the *Australian* demonstrated, the Liberal Party had to address the image created by Keating of Hewson as someone with the "personality of a filing cabinet". The *Australian*'s article provided a glimpse of Hewson as a quiet achiever from an average, middle-class background who learnt the power of work, the respect of individualism and the compassion of a baptist ethic. The humanising of Hewson via the media was underway.

As with American political candidates Australian politicians have recognised the influence of pop culture to target younger voters. Nudged by de facto media advisor Dr Anne Summers, Annita Keating appeared on the cover of *Vogue* and Paul Keating donned Ray Bans for the cover of *Rolling Stone*. Meanwhile, Dr Hewson borrowed President Clinton's sax to jam with Norman Gunston. "Campaigning has been transformed dramatically over the last decade," says Rod Tiffen, author of *News and Power*. "There is more and more targeting of voters."

McMullan agrees that it is the ability to receive and collate information which has transformed political campaigning. "Computers and direct mail allow it to happen more effectively. It's the application of new technology to old objectives. Direct mail is a weapon for what we used to call narrow-casting which is the opposite of broadcasting. It's a message that goes directly to some people rather than just spraying the message into the air.

"We use that information to develop policies and then communicate those policies to people generally *and* those with particular interest. That's what Edmund Barton and Alfred Deakin did in the first elections of federation. Now it simply means that modern communications do it in new and exciting ways."

Information of course comes at a price. It is here that Australian politics shares similarities with the American model in its reliance upon money. "The last election was the most expensive in Australian history," says Tiffen. "Over the last 10 years the cost of running a campaign has gone up ridiculously and is an enormous source of potential corruption and deal making. WA Inc being the prime example. Money in that sense gives political parties a crucial advantage in terms of advertising, the research you can pay for and the people you can put in the field."

Kelly's *The end of certainty* describes "the tyranny of the electronic media" as dictating "politics on the run". This has the political advantage, as the Liberal party's former federal director Tony Eggleton says, of cutting out the middleman: the media commentator. Indeed campaign directors cite faxes and phones as the great assets of the modern political campaign. Yet all politicians understand that to get the right message out, they must nurture the media, or at least foster 'friendlies'. Perhaps the classic example of this were the relationships Paul Keating built up in the Press Gallery as he plotted his ascendance to prime ministership over the last 20 years.

"Whitlam was popular with the press gallery," Tiffen adds, "because he was intelligent and quick and willing to talk to them. In that sense he was one of the first 'modern' politicians. The journalists were of the same generation and better educated than their predecessors in Canberra – they were open to Whitlam's 'quality of life' messages."

However voter's perceptions cannot be changed overnight, as politicians have learnt to their chagrin. At best, the media can be used to massage those perceptions into a more favourable light. As the *Sydney Morning Herald*'s Alan Ramsey observed of the GST debate between Keating and Hewson on Channel 9's Willessee programme: "If Hewson was an evasive wimp who refused to say how a new $24 billion tax will create even one job, then Keating was a forceful and aggressive advocate. And if Hewson was cool and unflustered under fire, then Keating was a rude loud mouth who wouldn't let his opponent get a word in. It all depends on your point of view."

As for the politicians' position, notes of the evolution of political campaigning in Australia: "The three decades since Menzies retired from politics have seen dramatic and radical changes in the media... the extension of media personalities into the political process, the evolution of the TV 'superstar' interviewer/commentator, the nature and impact of political comment, and the speed with which it all happens (video tape, fax machines, computers and mobile telephones). Menzies would not recognise the media world of today. I'm not sure he would have liked it very much! In his era he was much more in command." ●

electroPLASM

Over the last two centuries an aura of mysticism has tended to accompany each technological advance. John Potts contacts the ghost in the machine.

The development of the camera was a boon to those intent on recording and therefore 'proving' the existence of a parallel spirit world. In the 1870s the ectoplasmic form of 'Katie King' was summoned up at seances by a teenage Londoner called Florence Cook. These apparitions were photographed (left) by the eminent physicist Sir William Crookes.

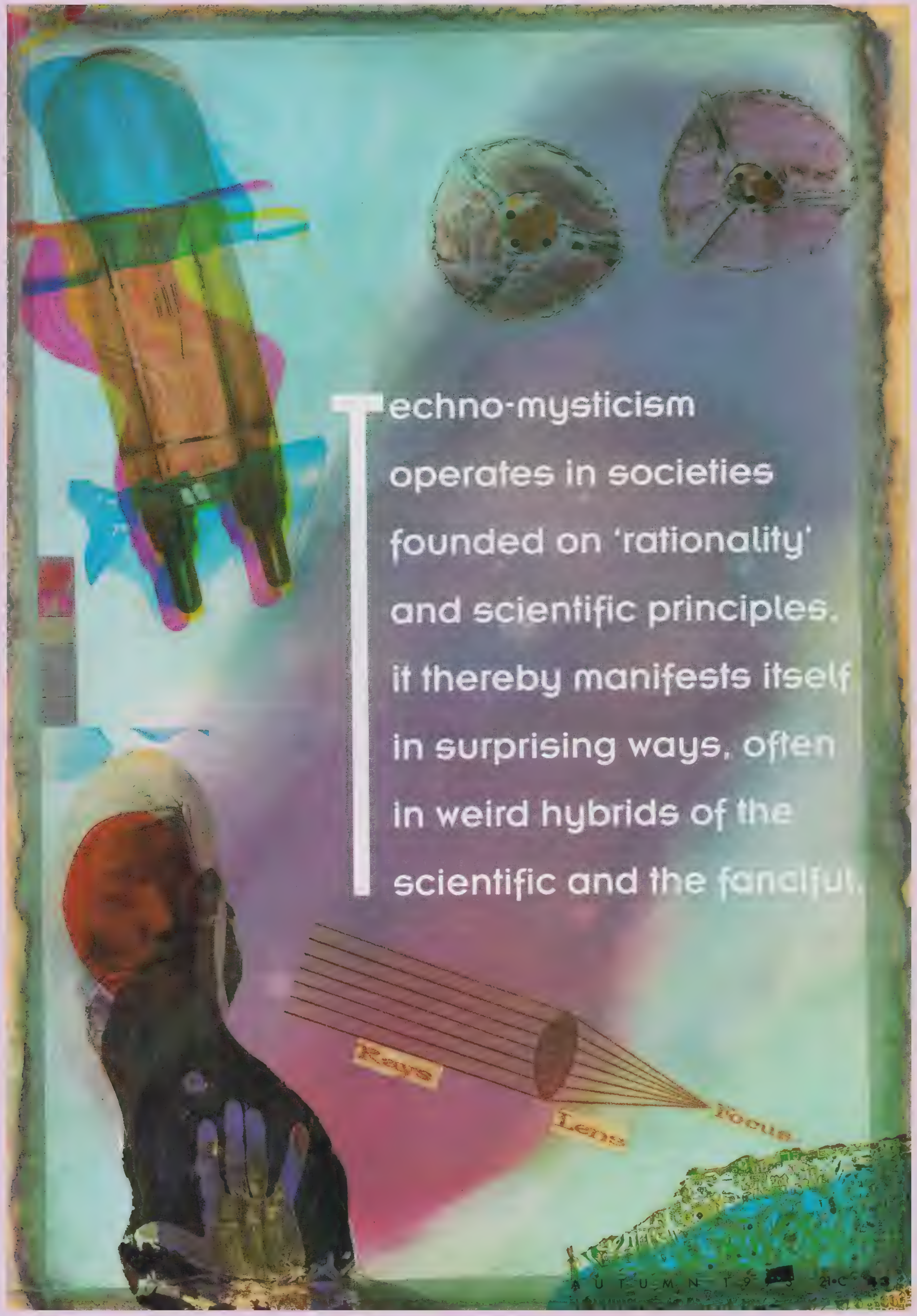
A strange side-line to the development of new technology has flourished in the 20th century, but its roots can be traced to the 19th century and even earlier. 'Techno-mysticism' is a constant that ranges from the cult of electricity of the 1830s to the most recent speculations on virtual reality (VR). It was present at the birth of photography, radio and cinema; it has prospered in research into the parapsychological and the super-normal; it has energised science fiction; it has been lavished on countless commodities in countless advertisements; it is evident today in the metaphysical haze enshrouding digital technologies and their effects.

Techno-mysticism invests objects with magical properties. In this it is similar to the mysticism which has always pervaded human societies. The difference with techno-mysticism is that it operates in societies founded on 'rationality' and scientific principles. It thereby manifests itself in surprising ways, often in weird hybrids of the scientific and the fanciful. This was the case when radio waves were claimed to cure cancer, or the voices of the dead were detected on magnetic tape. In instances like these, sober and methodical researchers argued their cause with scientific rigour.

Whereas pre-industrial mysticism and various religious structures functioned often as a form of social control, in contemporary Western culture it attests to the endurance of the 'irrational' in a rationally ordered world. Thus techno-mysticism is particularly relevant in the 1990s, which has witnessed a real resurgence in all manner of spiritual and supernatural beliefs. Contemporary New Age mysticism expresses a loss of faith in rationality and technology, as people turn to clairvoyance, astrology, palmistry or tarot for direction.

Contemporary mysticism is in part a reaction against the principles of industrialism. The doctrine of progress, faith in the machine, the utopian dream of technological cities, the technological quick fix of social problems – all these beliefs have been rocked over the last three decades. A new scepticism towards technology has been generated by heightened environmental awareness. Through the media, we are aware of massive degradations of both ecosystems and

ILLUSTRATION: THOMAS CORRELL


Techno-mysticism
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scientific and the fanciful.
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urban systems. Our post-industrial age wishes to distance itself from the excesses of the preceding age. Accordingly, some of the wilder claims made for VR – that it will create new worlds of the imagination, new connections between minds – fit into a wish to escape the problems wrought by industrialisation.

Yet ironically, it was in the 19th century – when high hopes were held for the industrial miracle – that techno-mysticism began to take shape.

electric dreams

In 1820, the Danish physicist Oersted discovered the properties of electro-magnetism. Only a year later, Faraday's experiments opened up the possibilities of electric motors. These discoveries excited the scientific community with the prospects of harnessing electric current. But two years before Oersted's announcement, a work was published which has had a more enduring impact on the Western world's imagination.

A mania for magnetism in the late 18th century resulted in salons where the fashionable of Paris gathered around Franz Mesmer's tub of water, called a banquet, that was charged with 'animal magnetism'. The patients applied ropes leading from the tub to their afflicted parts hoping for a cure.

Mary Shelley's *Frankenstein* was published anonymously in 1818. From that tentative beginning, its fame rapidly escalated. From the 1820s to the 1990s, it has been the staple narrative pattern of science fiction. The scientist creates life, in the form of a technological double of humanity. Through mishap, or as a result of the inventor's megalomania, the creature causes havoc – and finally destroys its guilty creator. This pattern is repeated over and over in science fiction, right up to the 80s' *Bladerunner* and *Terminator 2*. The Frankenstein story forms our most potent myth of technology. It is the dark underside of the doctrine of progress. And it has emerged more forcefully since the 1960s, when notions of progress have come under increased suspicion.

Shelley's Dr Frankenstein is an amalgam of medieval alchemist and modern man of science. Through a series of rationally controlled experiments, he uncovers the secrets of life. And it was precisely this mix of scientific method and alchemic goals which drove the techno-mystics of the 19th century. They had Frankenstein's zeal, but not Shelley's moral caution. They were less concerned with the negative consequences of technology than they were excited by hopes of disclosing life's mysteries.

Nineteenth century techno-mysticism, then, was motivated by two main factors. First, the rationalism of scientific enquiry had eroded much religious faith. The mysterious aspects of human experience could be preserved by endowing electricity, or "animal magnetism", with mystical powers. Second, there was undoubtedly a great awe at the wonders of technology. Electricity was an invisible form of energy. Its extraordinary powers could easily be imbued with a magical presence. Many new technologies had seemingly miraculous powers: technology moved in mysterious ways, its wonders to perform.

Around the 1830s, strange quasi-scientific practices emerged in Europe and the United States. They incorporated the ideas publicised in previous decades by Dr Mesmer, and by the disturbingly named Father Hell. The latter was a Jesuit priest who conducted experiments using magnets attached to human bodies. This practice, drawn from 17th century mystic medicine, apparently cured many of the Father's patients. Mesmer developed these notions into a general theory of "animal magnetism": hypnosis was used to rectify the "magnetic fluid" of patients.

By 1830, a science had developed called "electrical psychology". Its major practitioner, John Dods, instated electricity as the body's ruling principle, replacing Mesmer's animal magnetism. For Dods, electricity was "the grand agent employed by the Creator to move and govern the universe". Dods' ideas demonstrate the fusion in early techno-mysticism of religion and science. Other protagonists, however, were more secular. J. Stanley Grimes, for example, travelled the American countryside demonstrating his methods of "electro-biology". This was really a trumped-up blend of mesmerism and phrenology (analysing personality from the shape of the head). Especially in America, such weird hybrids as "phreno-magnetism", peddled by travelling showmen, captivated audiences with an alluring mixture of science and magic.

Out of this volatile brew of religion, miracle-working, mysticism and charlatanism, emerged the doctrine of spiritualism in the 1850s. Spiritualism claimed to be a religion based on science. It asserted that the soul or spirit, as taught in religion, could be verified by scientific method. It can thus be seen as one of the first organised attempts to bridge the

widening gap between religious belief and the rationalist demands of science. Spiritualists both embraced and explored the world of mediums, clairvoyants and materialisations of the dead. They conducted seances, in the belief that mediums contained in their bodies a substance called ectoplasm – particularly amenable to conveying the spirit world. The credibility of mediums was rigorously tested through questioning: this procedure was meant to furnish "evidence" of their authenticity.

The other major development in 19th century mysticism was centred on theosophy (literally, God-knowledge). Founded in 1875, the Theosophical Society was an amalgam of scientific learning, occultism, and Eastern wisdom. It can be regarded, in its emphasis on magic and mysterious forces, as a response to the machine age. And in its project of finding a spiritual base for humanity, it was a reply to the tenets of scientific rationalism. Darwin's theory of evolution had removed God from the human narrative; theosophy responded by proposing a new evolution on the psychic plane. Inspiration was taken from the Eastern notions of karma and reincarnation. Theosophy's exploration of life's mysteries attracted adherents like the poets Yeats and Pound. And its notion of spiritual evolution, shadowing the Darwinian model, lent the society a quasi-scientific sheen. While its general position was opposed to the rationality of science, it staged its own inquiries, such as investigation into the nature of matter. And it took a keen interest in new technologies of communication, especially radio.

many new technologies had seemingly miraculous powers: technology moved in mysterious ways, its wonders to perform.

media magic

Techno-mysticism has engulfed most new forms of communication over the last century and a half. First of these was photography, which was initially demonstrated in 1822. This new invention induced awe, wonder and, for some, fear. Photography produced a double – in the form of an image – of the human subject. It was a play of light that generated an exact replica of the self. This phenomenon had previously only existed in folklore and mysticism. Many cultures had believed in the existence of the wraith – an exact double of a person which appeared just prior to that person's death. Photography was regarded in some quarters as stripping away a person's astral body, or diminishing an individual's aura. At the very least, the mysterious process of photographic developing assumed for some observers the status of an alchemic rite: bringing an image-double of the self to life.

The 19th century version of the wraith was expressed as the etheric body. This was a techno-mystical concept: the ether, thought to be a universal substance, was a constant of 19th century science. In its mystical variant, it was considered the medium between spirit and matter. There were many attempts to use photography in securing an "etheric record". This meant recording the traces of all thoughts, ideas and emotions, thought to be preserved in astral light. The camera, it was claimed, could capture images of the souls of the dead. Many such spiritual records were submitted to psychic research centres, as proof of the spirit world's existence.

This obsession with representing the astral plane by technical means endured into the 20th century. Cinema was seen as a medium which produced ghost-like moving images and was accordingly enlisted in psychic research.

Specialist contraptions were devised; as late as the 1950s, the pseudo-science of radiesthesia was inventing special cameras to produce etheric photographs from blood-spots. Research into the aura likewise continued. A Russian electric technician named Kirlian took photographs showing a person's complete aura. In the 1950s, Kirlian photography claimed to image the "bio-luminescent" patterns of all living things.

The invention of radio was enshrouded in an even more powerful mystique. In the 1910s, it was celebrated as a means to unite nations, to speak to the dead, to cure cancer. The radio mystique drew on the cult of electricity, and on the age-old connection between auditory presence and the divine or supernatural (the voice of God, spirit voices). In Australia, early radio's leading figure, the managing director of AWA, Ernest Fisk, was a spiritualist. He, and like-minded advocates of the radio miracle, toured the country, demonstrating radio's role in the ether, or spirit-world.

The ether was considered both the substance through which radio waves passed and the zone inhabited by the dead: radio, it was proposed, would operate as a kind of electronic medium. Later, Sydney commercial station 2GB was licensed to the Theosophical Society, which had a strong presence in the 1920s and '30s.

One final instance of techno-mysticism in media is the Voice Phenomenon. This was first publicised in 1959, when a Swedish film producer named Jurgenson was playing back recordings on ordinary electro-magnetic tape. He heard extra voices on the tape: sentences spoken by persons known to be dead. Throughout the '60s, the phenomenon was investigated by scientists, engineers, psychologists and theologians. By 1969, a Latvian psychologist named Raudive had collected 100,000 samples of the voices of the dead on

tape. This research was published in his book *Breakthrough – An Amazing Experiment in Electronic Communication with the Dead*. Extensive studies were conducted in the '70s by such researchers as Professor Bender of the University of Freiburg, Germany. The existence of the phenomenon was verified under scientific testing conditions. Professor Bender proposed that the voices were electronic impulses projected by the subconscious mind. Others speculated that they were produced by disembodied entities of unknown origin.

Whatever the supposed origin of the voices, they have been recorded and studied up to the present day. Researchers still attempt to register the phenomenon, by one of three methods: leaving a tape recorder on 'record' with the volume on maximum; using a diode instead of a microphone; tuning a radio between frequencies. All these methods are fraught with problems and easily challenged by sceptics. The advocates of the Voice Phenomenon, however, insist that their research is conducted with scientific precision. What the Voice Phenomenon ultimately demonstrates is that whenever there is a new technology of communication, there will gather a new generation of techno-mystics.

Kirlian photography was discovered in 1949 by a Soviet couple, Semyon and Valentina Kirlian. Objects placed directly onto film within a high frequency electrical field are surrounded by bright discharge like an aura which can indicate subtle changes in the condition of the matter through variations in colour, shape etc. The central photo above is of a living scorpion. The other two purport to show the fingertips of a girl before (left) and after prayer.

ghosts in the machine

Techno-mysticism has permeated the 20th century in several forms. Many of the early Modernists venerated the properties of new technologies. The '30s art movement The Futurists worshipped the machine in a delirium of speed and destructiveness. The Surrealists invested technology with a capacity to sanctify the world: their project, opposed to the doctrine of progress, was more akin to alchemy. The great Modernist architects like Le Corbusier preached a stringent economy of design, yet imbued their work with a spiritual purity of form ("God is everywhere in the building" was one catchcry). A utopian drive and spiritual depth characterised much of Modernism – until punctured by the irreverence of Pop art in the 1960s.

Industrial capitalism incorporated a degree of techno-mysticism: first, in privileging technical innovation as an autonomous sphere; and second, in the commodity fetishism that enveloped the products of the assembly line. Advertising was enlisted to endow products with a special allure. Commodities were coated with a gloss, or aura, to make them into essential purchases. The manufacturing of an aura around objects was extended to the celebrity: the 'star' is an entity composed of layers of image, hype and rumour, the whole endowed with a magical resonance.

Science fiction has been sensitive to this cultural process. The mid-'80s film *Christine*, for example, shows a car, fresh off a 1950s assembly line, imbued with the gleaming advertising aura of the time. The car re-emerges three decades later, demonically possessed by the spirit of the '50s. A more straightforward depiction of technology's powers is given in *Duel*. We never see the driver of the killer-truck, suggesting that the vehicle itself contains a malevolent drive.

The notion that technological objects have a life of their own is continually re-worked in science fiction; certain works deal acutely with the phenomenon. The TV series *The Twilight Zone*, which commenced in 1959, featured all kinds of unruly technologies. Buildings, cars, trains acted contrarily to expectations, as if invested with supernatural force. This form of techno-mysticism attests to a certain helplessness in industrial culture: mass alienation is transferred as a ghost into the machine. Particularly troublesome in *The Twilight Zone* were technologies of communication: phones, telegrams and radios were possessed by spirits, TV sets depicted reality before it happened. This reflected not only a 'Frankenstein' guilt or paranoia, as in standard science fiction, but also the mysticism that settles around new techniques of communication.

digital delirium

Which brings us to virtual reality. Consider these pronouncements by Jaron Lanier of the leading VR company VPL, and one of the technology's leading figures: VR is "a sponge that will absorb human energy"; it is "the first medium that doesn't narrow the human spirit"; it presents a "new objective level of reality". Indeed the mysticism in Lanier's vision is quite explicit, as revealed in this statement: "VR is sort of a talisman for Western Civilisation, a way for people to get ecstatic and be with each other".

For Lanier and like-minded techno-gurus, VR is more than a new form of representation: it is a transformational device. By immersing themselves in simulated worlds, users will connect with each other in a computer-generated domain. This "telecollaboration", it is hoped, will overcome the alienation and isolation within contemporary culture. As well, by assuming different points of view in the virtual world, or even different identities (you too can fly, or be a praying mantis), new forms of consciousness will be revealed to the user.

There are several reasons for the extraordinary hopes held for VR. The notion of transformed consciousness is a direct inheritance from the 1960s: VR has often been acclaimed as "the LSD of the '90s". It isn't surprising, then, to see '60s survivors in on the act. Timothy Leary has claimed that "our brains are learning how to exhale as well as inhale in the datasphere". He hopes for a psychic evolution through VR: we will become amphibians, at home in both bodily and virtual realities. There are clear echoes here of the Theosophical Project of the 19th century.

Another remarkable thing about VR is that it was prefigured in fiction. William Gibson's 1984 cyberpunk classic *Neuromancer* remains the inspiration for many VR visionaries. The term 'cyberspace' was actually lifted from that novel and registered – much to Gibson's chagrin – by the American VR company Autodesk. Before Gibson, several science fiction writers, most notably Philip K. Dick, had explored the idea of simulation. Films of the early '80s like *Videodrome* and *Brainstorm* played with the idea of virtual worlds, years before VR technologies were made public. The fact that VR existed first in works of the imagination has coloured the expectations placed on it. For instance, Lanier has publicly envisaged a virtual reality in which to think something is to make it happen. As computer graphics specialists quickly point out, this is impossible with existing technology – or any foreseeable development of it. In this case, Lanier's vision is more than fanciful: it is a form of sympathetic magic.

The final reason for the mystical cloud around VR relates to digital information itself. Its chief characteristic is its immaterial nature. Vast bodies of information are rendered into zeroes and ones and manipulated at will. Reality can be easily simulated and altered. This produces wondrous new effects, in the same way that electricity did in the 19th century. In the last couple of years we have already seen the digital regeneration of dead celebrities in Diet Coke ads, or pop stars singing duets with their dead parents. Many other manipulations, increasingly elaborate, will be possible in the future. VR perhaps has the potential to challenge the underpinnings of Western thought: when users perceive their bodies existing in a simulated immaterial space, what has happened to the mind/body split? Or the distinctions between inside and outside, presence and absence? The conceptual shifts made possible by the technology are extraordinary; as ever, mystical speculation is close by.

Similar shadows of mysticism envelop other contemporary scientific pursuits. In the emerging field of Nanotechnology, for example, science is already blending with metaphysics. In the future, it is proposed, infinitesimal machines will be inserted into our bodies. Our inner workings will be regulated by these machines, which exist on a fine line between the organic and the mechanical. At its most extreme, this vision promises a complete control over the structure of matter. Some proponents argue that the only hope for our species is to induce our own evolution through such technology. Of course, this obsession with evolution and with technology's transforming powers connects with the techno-mysticism of the 19th century. Little, it would seem, has changed.

some proponents argue that the only hope for our species is to induce our own evolution through such technology.

While developments in artificial intelligence have stalled to some extent, a willing replacement has been found in artificial life. This is a cross disciplinary pursuit, incorporating genetics, engineering and computer graphics. Artificial life calculates the genetic code of organic life, then simulates that life in the computer world, using animated graphics. Natural systems are disassembled and manipulated on a computer screen. There is talk of a "programmable matter machine". Artificial life uses digital-technology and genetic research in the age old pursuit of life's mysteries.

The digital mysticism of the 1990s is part of a growing general trend. A metaphysical dimension is becoming increasingly apparent in many quarters. A few examples: the cosmology of Stephen Hawking; the many attempts to link quantum physics with Eastern mysticism; Paul Davies' reintroduction of God into physics; the excitement surrounding the Human Genome Project, with its goal of naming the entire human genetic alphabet (shades of the ancient theological project: pronouncing all the names of God). The air is becoming mistier as the end of the millennium approaches. And one thing is certain: some form of techno-mysticism will survive into the 21st century. ●

John Potts is a lecturer at the University of Technology and Macquarie University, Sydney, in communications.

THE ECSTASY OF THE APOCALYPSE

The dead will rise from their graves, the blessed will rise to heaven and cats and dogs will live together. Ashley Crawford contends with the wrath of God.

The faithful rise on laser beams of light to paradise. The evil are engulfed in fire on the battlegrounds of the Middle East. Welcome to Armageddon, the ultimate battle prefacing the ecstasy. Dateline: the year 2000.

That, at least, is one scenario depicted by some of the more extreme Christian and Islamic fundamentalists intent upon believing in the impending apocalypse. The dates shift. The first seconds of the year 2000 are a convenient assignation, but so was October 29, 1992 for the Dami Missionary Church and in Judea in the early years of the 3rd century a walled city was seen in the sky early every morning for 40 days – a sure sign that the second coming was imminent.

However with the ending of the millennium, extremist groups will inevitably turn rabid. This is certainly the pattern of history; where ranters, mock-Messiahs, heretics and priests of various religious beliefs have prepared themselves for the end – through prayer or self-flagellation – as the millennium draws to a close.

There have been a few false starts along the way: extremists branching out from the three key religions of the Old Testament – Judaism, Christianity and Islam – have read the signs of the impending apocalypse into everything from spectral floating walled cities to the threatened nuclear conflagration between the US and the USSR. Nostradamus predicted a few apocalypses, as did the Ayatollah Khomenhi with an accuracy worse than the local weather report. Today, the Four Horsemen of the Apocalypse which precede 'The End' in the book of Revelations are seen by some as AIDS, the ozone hole, global warming and crack. In the early '80s the Antichrist was Gorbachev, today perhaps it's Saddam Hussein. That's one of the handy things about predicting the apocalypse, there's always plenty of talent queuing up to fit the apocalypse's starring villain, just as there is a saviour waiting in the wings.

APOCALYPSE ON MAIN STREET

Not all of the apocalyptic extremists come from obscure cultural blocs. Some can get quite mainstream, like the President of the United States.

When Ronald Reagan became president in 1980 many people thought it was the beginning of the end. His quest was no less than to rid the planet of the Antichrist and its 'evil empire' (cast as the affable Mikhail Gorbachev and the Soviet Union), even if this meant fulfilling aeons-old prophecies of the doomsday.

This policy approach – to rid the world of evil once and for all (along with most of its population) – made quite a few long-term planning decisions redundant. What, for instance, was the point in prioritising a clean environment in the face of an imminent nuclear holocaust? The agenda was made clear in 1981 by Reagan's Secretary of the Interior, James Watt, when he replied to the concerns of environmentalists that their arguments on behalf of future generations were pretty much irrelevant. "I do not know how many future generations we can count on before the Lord returns," he told Congress during a debate on the environment.

Reagan and Watt were far from alone in their extreme views on the impending future. Reagan was strongly influenced by the book *The Late Great Planet Earth* by Hal Lindsey. This account of the penultimate battle between Christ and the Antichrist was avidly consumed by at least 18 million Christian fundamentalists who purchased the book in the 1970s.

With the ending of the millennium, extremist groups will inevitably turn rabid. This is certainly the pattern of history; where ranters, mock-Messiahs, heretics and priests of various religious beliefs have prepared themselves for the end – through prayer or self-flagellation – as the millennium draws to a close.

ENCOUNTER BETWEEN THE EARTH AND A COMET, FROM *ACTUALITÉS ASTROLOGIQUES*', 1857

These avid supporters believed in the ultimate 'Dispensation'. The notion of Dispensation came from American fundamentalist preacher Clyde Ingerson Scofield, born in 1843. Scofield believed in the teachings of a John Nelson Darby who preached that "God had two plans and two groups of people with whom to work. Israel was God's kingdom here on Earth and the Church (Christianity) was God's heavenly kingdom."

According to Scofield and Darby, their God has divided history into seven seven-year plans, called 'Dispensations'. As American commentator Gore Vidal notes, their God is "highly bureaucratic, even Leninist in his approach". To explain his theory, Scofield rewrote and published his own 'Bad News Bible' – the *Scofield Reference Bible* in 1909 which has since sold several million copies. The bottom line of the Dispensations has Christ defeating the Antichrist at Armageddon, 55 miles north of Tel Aviv. Before the big bang the 'good Christians' will undergo 'Rapture', rising to heaven, and the bad will remain on earth to burn. The last Dispensation has God returning with the 'Raptured Ones' who live happily ever after. Not that there will be many left, according to Hal Lindsey, a latter day Scofield whose *The Late Great Planet Earth*, specifies that only 144,000 Jews will remain alive after the battle of Armageddon, all of whom will convert to Jesus "like 144,000 Jewish Billy Grahams turned loose at once" as Lindsey states. Not everyone's idea of heaven. This 'gospel' was picked up avidly by American TV evangelists Jerry Falwell, Pat Robertson and Jim Bakker. In 1984 a poll found that 39 per cent of the US population believed in the obliteration of Earth by nuclear fire accompanied by Scofield's 'Rapture' for the 'good'.

Ronald Reagan was himself enraptured by the notion of 'Rapture'. One almost envisages the ultimate alliance in Reagan's mind: Gorbachev the Antichrist attacks Israel. Meanwhile the US military, under their commander-in-chief, team up with the Lord and some Star Wars technology and beat the Sovietskys to a pulp.

Of course Gorbie messed all this up by being not the Antichrist, but a beleaguered good guy seeking help, not hell, from the US. That didn't stop some serious speculation in the White House and among highly rating fundamentalist Christian broadcasters. The Reverend Jerry Falwell, interviewed by the *Los Angeles Times* (4 March, 1981), stated: "We believe we're living in those days just prior to the Lord's coming". When asked for an estimated time of arrival, Falwell said the Lord has warned against giving dates, however he qualified: "I do not think we have 50 years left. I don't think my children will live their full lives out...." Reagan wasn't about to disagree in a recorded conversation with Falwell in

which he confides, "Jerry, I sometimes believe that we're heading very fast for Armageddon right now".

Jerry Falwell was in tight with the Reagan administration, attending National Security briefings on US plans for nuclear war with the Soviet Union and acting as an advisor during 1983. It was during this time that Falwell began a series of Holy Land Tours in Israel.

OUT OF HARAM'S WAY

According to many extremists, the site of final conflagration will be within the old walled city of Jerusalem, atop Mount Moreiah where the third holiest shrine of Islam – Haram al-Sharif – is sited. Within the shrine is the Dome of the Rock, a huge boulder from which the prophet Mohammed is believed to have ascended to heaven. Coincidentally the grounds contain the 60 metre high, 490 metre long wall known as the 'Wailing Wall'. Central to both Jewish millenarians and Christian Dispensationalism is that the Messiah cannot come (or return) until the Temple of Jerusalem is rebuilt on the site where it once stood – and many Jewish and Christian fundamentalists believe that site is where Haram al-Sharif now, rather inconveniently, stands.

To many the future of life on Earth is balanced upon the fate of The Holy Mountain with the result that fanatics have launched multiple terrorist attacks on the shrine (over 100 between 1967 and 1988). There are also many fundamentalist Christian groups supporting the potential of rebuilding the temple, believing that its resurrection will be the central event leading to the apocalypse. The Christian extremists pray for the nuclear annihilation that will lead to the return of the saviour while the militant right wing in Israel pray for the *jihad*, or holy war, with the Arab world. On the other side Muslim extremists pray for the same battle for not altogether dissimilar reasons.

In 1984 a poll found that 39 per cent of the US population believed in the obliteration of Earth by nuclear fire accompanied by Scofield's 'Rapture' for the 'good'.

Many archaeologists dispute the accuracy of the site as Mohammed's launching pad, and fund-raisers visiting the US have been known to omit the fact that a Muslim mosque sits atop the real estate upon which the temple will be rebuilt. Despite these facts, the Christian fundamentalist Jerusalem Temple Foundation aims to raise $US100 million annually to finance the project and its priesthood.

THE ANTICHRIST SHIFTS TOWN

With the death of the Soviet empire, many Western policy-makers are concerned that Islamic fundamentalism may become the next millennial threat to liberal democracy.

The major event that inspired Islam's latest *jihad* was the 1979 Iranian revolution which defined its real enemy as the 'Great Satan' in the form of Europe and America. Iraq's Saddam Hussein was similarly extreme with religious terminology in his battles with George Bush, having twice called for a holy war against the US and urging the Iraqi people and armed forces to fight the "forces of evil as you fought the enemies of God". Whether Saddam's proposed holy war will

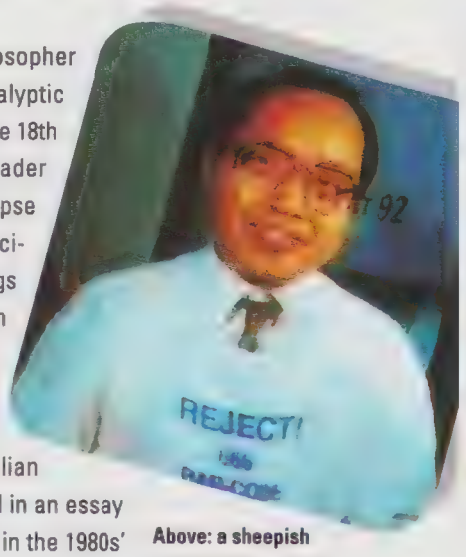
The Future of the Apocalypse

The end may not necessarily be nigh. As Damian Coleridge reveals, in the end there may be a beginning.

At 2.00 a.m. on October 29, after the world had not come to an end as promised, a group of South Korean religious leaders stepped in front of the media to apologise for the planet still being intact. There would be no apocalypse... yet.

As the Dami Missionary Church discovered, there is always a market for an apocalypse now. The public, so it seems, crave dates and times and lurid descriptions. Along with horoscopes and tattslotto, apocalypse brightens up our lives. So too for the media, for whom it represents a perfect photo opportunity and a readymade scoop, even though the next day's sales are under threat. Yet for all the carry-on about the end there is a great deal of serious discussion at the moment about endings. "The talk of apocalypse is a part of this, though it is apocalypse understood in a 'modern' way.

According to the French philosopher Jaques Derrida, the modern apocalyptic tone was first heard at the end of the 18th century. Nowadays when the broader populist media refer to the apocalypse in terms of LA riots or Bosnian atrocities – rather than the second comings of Messiahs – we fulfil American essayist Susan Sontag's 1971 suggestion that "we live in an age of permanent apocalypse".



Above: a sheepish representative of the Dami Missionary Church announces on TV that the apocalypse has been postponed.

Twenty years later the Australian academic Margaret Plant observed in an essay entitled 'Endisms and Apocalypses in the 1980s' that "apocalypsism is surely now proven rampant". However Plant distinguishes between the terms 'endism' and 'apocalypse': "Endism is not terminal and thus bypasses judgement,

lead to the apocalypse remains a moot point, however his missiles remained aimed at both Israel and Saudi Arabia in early 1993. Ironically, given the extremist position of the previous Reagan administration, the Commonwealth of Independent States and the new US administration are now linked as allies against Hussein and must supposedly stand together as "enemies of God" in Saddam's eyes.

'I AM BECOME DEATH'

Saddam and the Ayatollah were not alone in their use of religious imagery for their apocalyptic ambitions. One global symbol for world destruction – the giant nuclear mushroom cloud – inspired Winston Churchill to describe it as "the second coming in wrath". President Truman remarked: "It may be the fire destruction prophesied in the Euphrates Valley era after Noah and his fabulous Ark". The A-bomb's co-creator J. Robert Oppenheimer came forth with a line from the Bhagavad Gita: "I am become death, the shatterer of worlds!". The code name for Tinian, the island from which the nuclear strike against Japan would be launched, was 'Papacy'.

The use of religious language and imagery, predominantly Christian, in support of holocaust is a tradition of which US Vice-President Al Gore is highly critical.

"For some Christians," writes Gore, "the prophetic vision of the apocalypse is used – in my view, unforgivably – as an excuse for abdicating their responsibility to be good stewards of God's creation. Former Secretary of the Interior James Watt, who deserved his reputation as an anti-environmentalist, was once quoted as belittling concerns about environmental protection in part because it would all be destroyed by God in the apocalypse.

"Not only is this idea heretical in terms of Christian teachings, it is an appallingly self-fulfilling prophecy of doom. It is noteworthy that Watt did not see the need to forgo other

"Former Secretary of the Interior James Watt was once quoted as belittling concerns about environmental protection in part because it would all be destroyed by God in the apocalypse."– US Vice President Gore.

obligations, however. He did not say, for example, that there was no point in conducting a bargain basement sale of grazing rights on federal rangelands to wealthy friends because the Four Horsemen are galloping this way."

Gore adds: "The religious ethic of stewardship is indeed harder to accept if one believes the world is in danger of being destroyed – by either God or humankind. This point was made by the Catholic theologian Teilhard de Chardin when he said, 'The fate of mankind, as well as of religion, depends upon the emergence of a new faith in the future'."

Armed with such a faith, says Gore, we might find it possible to "resanctify the Earth, identify it as God's creation, and accept our responsibility to protect and defend it".

CULTS, HERESY AND SEX PISTOLS

Perhaps under the Clinton/Gore administration there may be some return of faith, however this certainly won't stop the heretics. Indeed, it is more likely to be fodder for the mil-

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damnation, salvation. It refers not to the end of the world, but to the end of history AS WE KNOW IT". Plant uses endism to describe *an* end but apocalypse refers to *the* end, in the traditional sense that it terminates human time.

In the Biblical apocalyptic tradition, beginning in the 6th century B.C., there is an end, a decidedly dramatic end, but also a new beginning. Interpreting this biblical model Australian scripture scholar Mark Coleridge characterises the apocalypse as "essentially positive, a way of hope, of looking into a future which is anything but catastrophic". According to Coleridge, hope is at the heart of apocalypse, but it is a hope hard won in the face of constant historical disappointment. It becomes a more complex matter.

This hope is a challenge to the way we live at present. Indeed built into the apocalyptic vision is an ingrained critique of the society of the time. Theologian Tony Kelly describes it as "a new imagining of one's way of being in the world, critical of the prevailing culture". In that sense, says Kelly, we have to live with "an apocalyptic sting." Such a vision is not much on offer. One has to look hard to find it on TV, or in the latest video game, or down at the local newsagents.

In the Biblical tradition the future is in the hands of God who initiates it and realises it, (with our co-operation). In other words, expect to be surprised, even upset, because though we have to seriously consider such precepts employed by organisations like the Australian Commission for the Future as "creating a vision of where we want to go and determining what positive actions will enable us to get there", we may come unstuck like the forecasters of weather, the economy and technological advancement.

The philosopher Ernst Bloch, who has written on the revolutionary, apocalyptic elements within the Christian tradition, suggests that there are two kinds of future – the future that we plan for and the future that comes to meet us. "The future that comes to meet us is the real future, it's God's future," says theologian John Honner, who believes that Bloch's notion is a way of reminding us that "there is a future that's going to meet us apart from the future we are planning for, and the future we are planning may be, but the future coming to meet us *will be* – and that's real hope".

Despite this, many Australians, according to surveys executed by the Australian Commission for the Future, have a fear of the future. The future that is coming to meet them is not what they had planned for at all. Consequently the future is perceived as a distinct threat. One of the things that may be called into question is our relationship to time. Western society has inherited a clockwise view of time as these units

In a largely secular society an heretical stance is difficult to achieve... it is no longer enough to anounce that "God is dead".

lenarianists. Cult movements, often resisting the authority of established religion or governments, have existed throughout the world since the beginning of human history. The Christian history of heresy and millenarian cultism, inspired by the belief that the millennium will bring the apocalypse, harks back at least to the third century A.D. when the Circoncellions attacked theological enemies with clubs and blinded those loyal to the Church of Rome with mixtures of lime and vinegar.

Like the many cults that followed, members of the Circoncellions sought martyrdom in the most dramatic fashion possible. Inspired by the impending apocalypse, the Circoncellions were succeeded by a bewildering group of heretical and extremist groups facing the millennium. These included the fraticelli and the apostolics of Gherardo Segrelli, the brothers of the free spirit, and various Catharist groups who would regularly starve themselves in a ritual known as the 'endura'. Intensifying as each millennium draws to a close, such cult movements are far from restricted to medieval times. Numerous contemporary movements exist including recent Western examples under the leadership of Charles Manson and Jim Jones.

Italian cultural critic Umberto Eco attempted a summation of such movements in his collection of essays *Faith In Fakes*: "The cult is born in a moment of crisis (spiritual, social, economic), attracting on the one hand the truly poor and on the other some 'rich' with a self-punishing syndrome; it announces the end of the world and the coming of the Antichrist."

Eco points out that Jim Jones expected a fascist *coup d'état* and nuclear holocaust when he led his followers into a mass 'suicide'. In many ways Jones' cult was typical of Millenarian groups – disaffected and suffering from a sense of social insecurity, a situation which, Eco notes, is rife in the United States.

In his ambitious "secret history of the twentieth century" Greil Marcus attempts to link the extremism of medieval heresy with the more contemporary movements of the Situationists (who were integral in the Paris riots of May 1968) and the Punk movement of the '70s. Indeed, given Eco's definition and Marcus' links, the notion of apocalyptic millenarianism can be drawn right through to the end-of-the-world scenario screamed by the Sex Pistols' Johnny Rotten – NO FUTURE!!. As Marcus notes: "They [the Sex Pistols] had begun as if in pursuit of a project: in 'Anarchy in the UK' they had damned the present, and in 'God Save the Queen' they had damned the past with a curse so hard that it took the future with it. NO FUTURE".

In a largely secular society, an heretical stance is more difficult to achieve. It is no longer enough to announce that "God is Dead" as the Lettrist poet Michel Mourre did at 11.10 a.m. on 9 April, 1950 on the altar of Notre-Dame during Easter High Mass with the result that the cathedral's Swiss guards, swords drawn, attempted to kill him.

However, with the year 2000 closing in, millenarianism will inevitably rear its head more and more dramatically. Religious issues are already visiting the news with an amazing regularity, whether in Iraq or Bosnia. And the extremists and cultists are no doubt scattered across the globe, waiting... for rapture. ●

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press on inexorably into the future. Clearly this is a fiction which has less and less meaning for us now. An alternative approach, and in this the Year of Indigenous Peoples, an appropriate one, might be to consider the attitudes towards the Aboriginal Dreaming.

"For a long time," says Honner, "we called the Dreaming the 'Dreamtime', as if it were in the past. We have subsequently discovered that the Dreaming was not only in the past, but is related to the future and so constructs the present. The Dreaming is an overarching view of reality. Biblical notions of time still have this overarching view of a greater reality. For the Hebrew people there was something waiting for them – a hope, a promise articulated in various ways, of which apocalypse was one."

We often think of apocalypse as otherworldly, breaking in upon our world, but American scripture scholar David Batstone points out that until the 18th century, apocalypse was "part of one reality, one spirit world". The example he cites is from the film *Black Robe* about Jesuit missionaries going among the Canada's native Huron Indians in the 17th century. For the missionaries time was told by a clock and the promise of eternity was beyond time. But for the Hurons time was village life and its social rhythms. A timeless world unrelated to the social realities of the present was incomprehensible to them. For the tribe "there was one world of spirit". It is a reminder that, according to Honner, "we need to look not only to physics to instruct ourselves about time, but to metaphysics, if we are to begin asking deeper questions about who we are". This may be part of imagining a future alive to all sorts of possibilities.

In essence, apocalypse is about a future vision which challenges and gives shape to the present. It is a way of imagining and speaking about that future. (But it may also remind us that the future we are planning and working for, may not eventuate.)

However, amidst all the talk of endisms and apocalypses it may be difficult for us to recognise apocalypse as a way of imagining and talking about that sort of future; and perhaps it is part of a larger difficulty at the moment, "when what is to come is apparently beyond the powers of imagination to imagine". The real task, as the Irish philosopher Richard Kearney said of the postmodern imagination, is "to envision the end of modernity as a possibility of re-beginning". Whether it be the end of modernity, or apocalypse of one sort or another, this possibility of re-beginning is what is at issue. ● **Damian Coleridge is a producer for ABC Radio National. Last year he presented a program titled 'Apocalypse Now?'.**

THE PERSECUTION OF THOUGHT

The trials and tribulations of scientists in their pursuit of new ideas have often led to damnation by the church.Today radical thinking can still lead to serious ostracism. Ashley Crawford and Sandra Webster report. ▶

In the Elizabethan era, Hawking and his wheelchair may well have been incarcerated and Hawking accused of not only blasphemy, but, most likely, witchcraft.

Galileo is finally off the hook. The scientist was pardoned by the Vatican in 1992, but whether this means he has stopped burning in eternal hell is anybody's guess.

In 1979, Pope John Paul II declared that the Roman Catholic Church may have been mistaken in condemning Galileo, but it was not until 1984 that the Vatican published all documents relating to the trial. Galileo first came to the attention of the church in 1613 after publicly declaring that Copernican theory was consistent with Catholic doctrine. In 1616, the same year that Copernicus' work was placed on the Index of Forbidden Books of the Catholic Church, Rome ordered that Galileo could not "hold or defend" such theories.

During 1624, a new pontiff, Pope Urban VIII, held audience with Galileo on six occasions, a relationship which deteriorated with the publication of *Dialogue Concerning the Two Chief World Systems* in 1632 in which Galileo argued the superiority of Copernican theory to the Ptolemaic and Aristotelian traditions. In 1633, he was found guilty of disobedience by the Inquisition, forced to recant, and sentenced to life imprisonment. Galileo himself did not question his faith, quoting Cardinal Cesare Baronio, "The Bible tells us how to go to Heaven, not how the Heavens go".

However Galileo was far from alone in his tribulations. Throughout history and into the present day, examples abound of scientists incurring the displeasure of both church and state, as well as generating fear and uncertainty in the community. Today, a scientist might be persecuted and harassed for perceived political affinities rather than a crime against God such as in the case of Sir Mark Oliphant, Robert Oppenheimer or, more extremely, Wilhelm Reich. Punishment and ostracism for outlandish or radical ideas continues, jaundicing the reception of ideas that may affect the future in profound ways.

New technologies and scientific theories can pose serious challenges to existing social structures and mores. Think of the ethical and moral implications of such fields as gene pooling, which tests definitions of scientific and human roles in society. The development of such technology may serve a range of useful 'ends' but it also challenges community understanding about scientific development.

Nowadays few people maintain a wide-eyed, trusting belief in information about scientific developments, and ethical debate is no longer confined to university halls but actively engaged in popular media. The scientist who explores areas which trespass on taboo subjects, the 'sacred ground' of community opinion, may incur wrath and ridicule, suspicion and anger – a high price for services to science.

Although punishments are rather less severe today (few astrologers or mathematicians spend sleepless nights worrying as to whether they will be burnt at the stake), many of the issues remain. A highlight for many during the 1981 Vatican conference on cosmology was the meeting between two of the most prominent figures in the God/Science debate, Stephen Hawking and the Pope.

The Pope stated that the study of the universe's evolution after the big bang was OK. The big bang, he said, was the moment of creation, and thus the work of God and not to be questioned. Unbeknownst to the Pope, who hadn't received word from above, Hawking had just given his conference paper questioning just that subject: the likelihood that space and time were finite but had no boundary, meaning no beginning and thus no moment of creation. The Pope had not attended the conference, and no doubt would have been distinctly unamused to hear of Hawking's theories.

In the Elizabethan era, Hawking and his wheelchair may well have been incarcerated and Hawking accused of not only blasphemy, but, most likely, witchcraft. Others have not necessarily been so lucky.

The Faustian urge.

Key historical figures in the world of science and mathematics, since redeemed in intellectual circles, have suffered discredit, imprisonment and even threats of torture as the price of propounding their ideas. Wary of church anger, Leonardo da Vinci recorded his experiments and inventions in left-handed, mirror writing. While this may rate today as a basic, if not feeble security measure, the artist obviously felt compelled to act with caution.

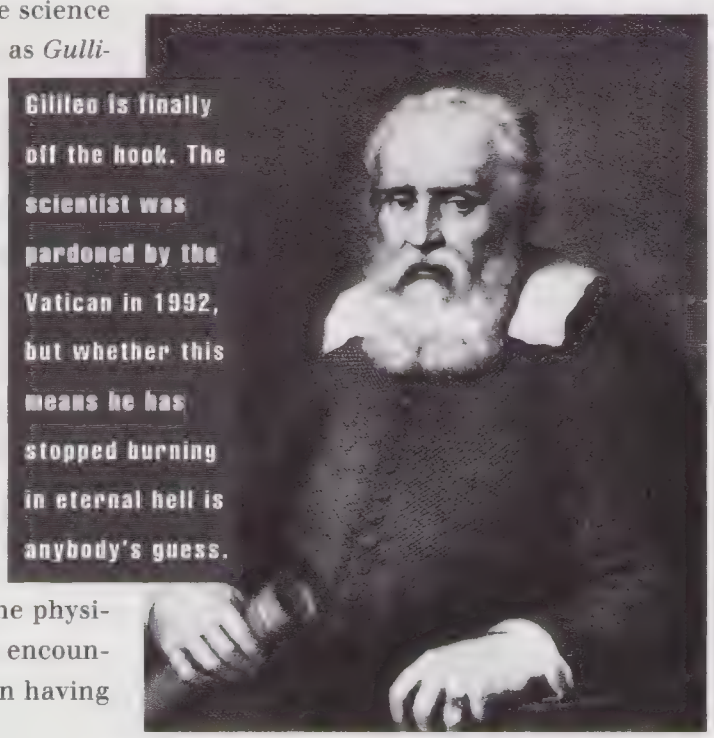
Almost 100 years before Galileo faced the Inquisition, Copernicus, published the classic text refuting the notion of a geocentric Earth. *On the Revolutions of the Heavenly Spheres* was declared "false and contrary to Holy Scriptures" by the grandly titled Theological Consultors of the Holy Office, who recommended the work be "suspended until corrected". In an age when Martin Luther could insist that scriptural references to a central and stationary Earth were indisputably true, the public role of scientist could be somewhat delicate.

Other scientists had equally strained relationships with

Thomas Newton, a figure-head of the Enlightenment, was also a practising alchemist, and produced some two million words, aside from his major works, on subjects like theology, chronology and alchemy.

their churches. Johannes Kepler, the German astronomer and mathematician, who insisted that objects and events in the Bible should not necessarily be understood in a wholly literal sense, was expelled from his professorship after refusing to embrace Roman Catholicism. The distribution of published observations from the developing empirical sciences would come to split the accepted union of faith and reason — but the Church was not going to surrender omnipotence without a struggle.

The public were also impatient with scientists. Members of England's Royal Society were ridiculed and satirised in popular journals and poems of the day when amazing results and significant achievements failed to appear. In the form of an inverted compliment, Swift, who certainly read many scientific publications, made science the target of his wit in works such as *Gulliver's Travels*.



The career of John Dee, the British alchemist, astrologer and mathematician, illustrates the fine line scientists of this period walk. Imprisoned in 1551 by order of Queen Mary Tudor on suspicion of practising magic, he came to enjoy a position of respect in the court of Elizabeth I. In her court, Dee tutored the Queen in the art of mystic knowledge. In the court of James I, however, Dee was neither received nor acknowledged and like the physician and alchemist, Robert Fludd, encountered any number of difficulties in having work published in England.

Thomas Newton, a figure-head of the Enlightenment, was also a practising alchemist, and produced some two million words, aside from his major works, on subjects like theology, chronology and alchemy. Newton also hid his anti-trinitarian beliefs, collected manuscripts which questioned the divinity of Jesus and the authenticity of the New Testament, and was steeped in Hermetic texts, studying sacred geometry and numerology. But Newton was publicly known as a deeply pious and discreet man – a necessary position for the President of the Royal Society.

Following the example of other alchemists, Newton hid controversial work. Alchemists who did publish, produced work thick with parable, enigma and allegory to protect themselves from the Church's might.

The growth of the modern secular state has not lessened the perilous status of the scientist, although the Inquisition may have been replaced by McCarthyist zealots or CIA operatives. Today, a scientist may not be tortured for professing unpopular beliefs which threaten power structures, but there is still a real danger in raising the ire of government power-brokers or the status quo of academic scientific beliefs.

In 1954, J. Robert Oppenheimer, the physicist who headed America's Manhattan Project during WWII, was called before the Personnel Security Board of the United States Atomic Energy Commission to answer a charge of disloyalty — a scene that echoes Galileo's involvement with the Inquisition of his day.

Senator McCarthy had a little trouble with the company Oppenheimer and his younger brother, who had been a member of the Communist Party, had kept before the war — associations which were known before he was offered the leadership of the Manhattan Project, but had all been conveniently 'over-looked'. Although people like George Kennan, the former ambassador for the United States to Moscow, gave evidence refuting any case of disloyalty on Oppenheimer's part, his security clearance was suspended — an effective means of curtailing his research activities and slurring his character.

As authors Stewart Cockburn and David Ellyard point out in their biography of Sir Mark Oliphant, *The Life and Times of Sir Mark Oliphant*, Australia had its own share of "McCarthy-style hysteria". In an affair described by Oliphant as "one of the most shocking episodes in the history of the Commonwealth Parliament", Sir David Rivett, chairman of the Council for Scientific and Industrial Research, was accused, on no better evidence than hearsay and opinion, in the House of Representatives, of communist sympathies — a

Today, a scientist may not be tortured for professing unpopular beliefs which threaten power structures, but there is still a real danger in raising the ire of government power-brokers.

ploy which effectively ended his career. Oliphant was also out-spoken in his condemnation of the systems which perpetuated such slurs.

One of the key players in the development of the hydrogen bomb, Oliphant became a vocal opponent of atomic energy policies not only of the US, but also the UK and the United Nations after the Hiroshima and Nagasaki bombings. In 1951, he applied for a visa to attend a Chicago nuclear physics conference. Oliphant joined a number of other scientists, including Nobel Prize winners, in being barred from entering the US. The American embassy insisted that visa approval had simply been 'delayed'. Two years later, he was still considered "inadmissible to the United States under law".

One of the tragic implications of this action for Australia was that Oliphant, one of the few experts in atomic energy in the world, was seen as a security risk in the eyes of conservative governments and was not invited to advise our government on the nine British atomic tests undertaken on Australian soil during the 1950s, including the four held at Maralinga. In the words of Sir Frederick White, then Head of CSIRO, "... it is obviously quite absurd for us to be thinking of making some contribution to atomic energy work without Mark's assistance". This "absurd" path was the one our government did indeed choose to follow.

With a neat touch of irony, empirical, rational science has re-introduced the subject of God and Creation into mainstream, scientific debate. When Stephen Hawking began discussing the concept of an instant of creation in his book, *A Brief History of Time*, a reviewer from the *New York Times Book Review* wrote, "The job of science, after all, is to explain the world around us without invoking divine interventions".

Paul Davies' book, *The Mind of God*, challenges assumptions that questions of creation and existence, or what Davies describes as "the Deity", can be understood only through the language of scientific rationality. While Davies comes to the somewhat frustrating conclusion that, "We are barred from ultimate knowledge, from ultimate explanation, by the very rules that prompt us to seek such an explanation in the first place", such a voice, at the very least, serves to provoke discussion of alternatives to central notions such as linear progress in scientific advancements.

'Left-of-field' scientific theories still engender fierce debate and call up hostile differences of opinion. When Bill McKibbin published *The End of Nature* in 1989, he received wildly differing reviews. *Newsweek* described the book as being "devoted to fatuous pronouncements" and "empty prescriptions". The *Times Literary Supplement*, while not lavishing unqualified praise, believed that, "McKibbin writes lucidly, with extensive reference to the latest scientific findings on global warming, deforestation, acidification and population growth".

When Rupert Sheldrake published his first book, *A New Science of Life*, it was denounced in the prestigious *Nature* magazine under a banner stating, "A book for burning". Sheldrake has of course suffered considerable rejection for his theory of 'morphic resonance' (see issue 6 of *21•C*) and he continues to be treated as something of a charlatan by many in the scientific world. While burning his books may be going too far his theory is still partially 'censored' by his peers, which, if Sheldrake is ever proved to be right, will look rather shameful to future generations.

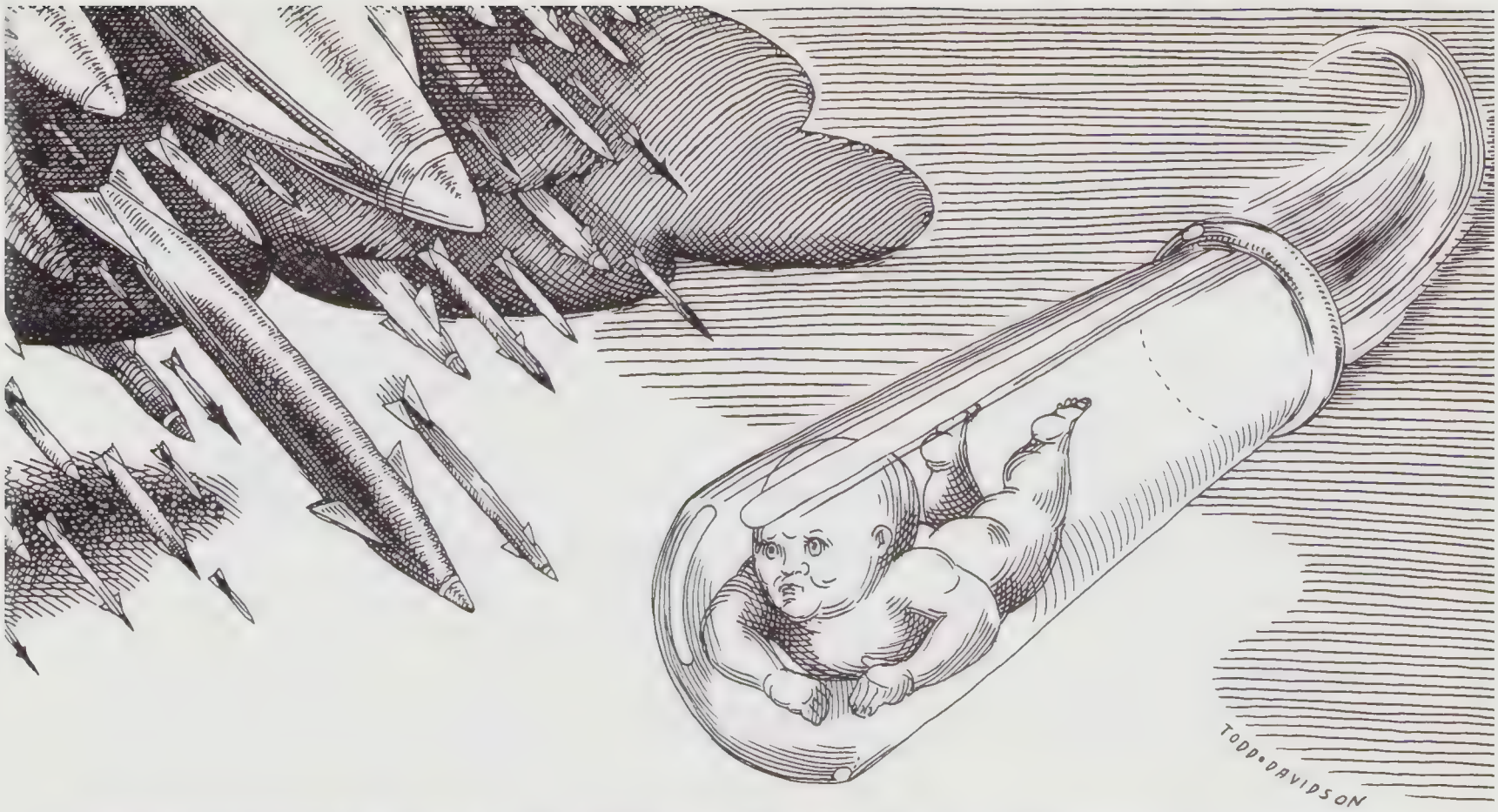
A contemporary example where book burning *did* occur is that of psychologist Dr Wilhelm Reich. It is hard to know whether Reich was crazy himself — his theories are certainly extreme enough to suggest he may have been — but we are unlikely to know due to the harassment he received from the American government. Reich's *Contact with Space: Oranur Second Report, 1951-1956* was published in 1957 and was promptly seized and burnt by the FDA. Reich was imprisoned. Reich, described by Sigmund Freud as his "most brilliant student", died in prison the same year.

Admittedly Reich's theories were on the extreme side, including a bid to modify the weather and a theory about the transformation of converting nuclear winds from atomic blasts into 'positive energy'. He also believed he had identified intergalactic space craft which he called the "Ea".

However, many of Reich's scientific peers treated his theories with some respect. It is difficult to know whether there was substance to his theories as his documents and papers were locked away by his executrix, Mary Boyd Higgins, and have remained unavailable to researchers and biographers.

Reich's ideas may seem crazy to many, but then so did Galileo's in the 1600s. Like Galileo, Reich was harangued and punished for his 'heretical' ideas with the result that Reich's research remains more in the world of science fiction than science fact.

The point is, however, that wild ideas are often the scene of great discoveries – while book burning and incarceration, or even peer ostracism, are far from good policy in the world of ideas. ●



DROPPING AN ETHICAL **bomb:** from 'little **boy**' to test tube **babies**

Can **ethics** keep pace in the fast lane of technological **progress**? Anna **Clabburn** applies the hypocratic oath to **science** and technology.

Alarming scenarios of a modern world blindly bound to – and manipulated by – the spoils of technological invention has become a media cliché in recent years. Such 'technofear' is linked to a concern with human 'morality' and 'ethics' – two words which many people feel are often forgotten in the complex lexicon of science.

In contemporary terms the questioning of limits and protocol may have started with the atomic bomb in Hiroshima, but genetic engineering and similar 'playing god' technology keep the levels of fear and scrutiny at fever pitch.

Amongst the numerous 'popular science' books released in recent years, Neil Postman's recent *Technopoly: The surrender of culture to technology*, describes a technological monopoly that, like a parasitic virus, cunningly attaches itself to democracy and mutates on human desires and needs. "Technopoly eliminates alternatives to itself – it does not make them illegal," says Postman. "It does not make them immoral. It does not even make them unpopular. Instead it makes them invisible... and irrelevant."

While Postman persuasively argues that readers should doubt their freedom of choice and question their faith in a future democratic world, he risks exaggerating the influence technology and its political derivatives has on society.

Postman's sensationalism is misleading given the humble stages of development in all areas of technology; from genetic engineering through to artificial intelligence and nanotechnology. However the ethical thrust of his hypothesis is shared by many contemporary commentators on the human relationship with advancing technologies. Questioning the ethics of progress rarely intends to reveal science and its pioneers as evil despots scheming to overtake the universe with intelligent bits of hardware, rather it emphasises that ethical issues should be paramount in decision-making processes that determine which areas of research are developed for application in the future.

As Postman observes: "The idea that if something could be done, it should be done, was born in the 19th century". The introduction of industrialisation gave unprecedented credence to ideals of pragmatism and functionalism. Darwinian science secured faith in a logical, physically based model of human evolution, pushing the metaphysical Biblical theory of Creation and the church into a relatively vulnerable position. This 'left-brain' priority remained largely unchallenged until it reached 'adolescence' around the time of the Hiroshima blast. In the face of society's encroaching 'maturity', science and its technology are revealed as merely one in

a long line of human faith systems. It too has its false prophets, incorrect predictions and is ultimately, like human beings themselves, fallible.

Archbishop Peter Hollingworth, noted for his vocal interest in the social impact of science and technological progress and a director of the Australian Commission for the Future, argues that equal resources must be assigned to assist society keep abreast of rapidly changing conditions as are currently invested in technologies. "Over the past 30 years we've been far too acquiescent and accepting of the introduction of new technologies which have displaced people," he says. "We introduce a whole lot of technologies and pay a huge sum of money so that the outlays go into improving the technology, not the conditions of workers."

Hollingworth's anxieties highlight a problem facing Western society: growing unemployment created by economic restructuring and rapid technological adaptation.

Postman argues that if competition is based on computational skills, a human being will lose against a machine. Programmers are only now beginning to 'equal the score' by attempting to make machines mimic human feelings of self-awareness and purpose; the machine still wins by the original rules. "The computer is the quintessential, incomparable machine of technopoly," says Postman. "It subordinates our spirituality... and supports its claim by showing that it 'thinks' better than we can."

For Hollingworth this isn't just a matter of competition but human dignity. "If it dehumanises it diminishes," he says. "Progress is good if it is enhancing the well-being of humanity and enhancing people's dignity. If it's doing something different... you shouldn't do it."

Physicist and philosopher Paul Davies is one of the scientific fraternity, like Stephen Hawking, who is endeavouring to humanise the discipline and bring the debate about the future of the world into the public arena. In *God and the New Physics* Davies draws parallels between contemporary science and traditional religious theology, describing physics as a profoundly humanist pursuit as tenuous in its material conclusions as any belief system: "A growing number of people believe that recent advances in fundamental science are more likely to reveal the deeper meaning of existence that appeals to traditional religion by asking what, if any, is the distinction between natural and artificial, between blind force and intelligent control? This is a new angle on the controversy about free will and determinism."

Australian/Canadian bio-ethicist Margaret Sommerville agrees in principle with Hollingworth and Davies that a critical perspective on pioneering science is essential. Sommerville advises humanity against expecting total control over natural processes. Speaking with Robyn Williams on ABC TV's *Quantum Interviews*, Sommerville said: "I think we should take notice of our feelings of fear. We can't afford, as scientists or as persons, to lose that deep sense of the mystery of life. We should act with due regard for the fact that we don't know everything. We never absolutely know what we're doing."

Sommerville's point is vividly illustrated in a recent article by Tom Curtis in *Rolling Stone* magazine on 'The origin of AIDS'. Curtis explored a link that has been made, albeit still hypothetically, between the administering of an oral polio vaccine to a large population of equatorial Africans in the late 1950s and the original outbreak of AIDS in the region. The point is clear: predicting the outcome of today's medical treatment on the future world is near impossible.

'Medical **ethics** committees have been a very serious **problem** to our society, they've been responsible for a lot of the **decline** in understanding and acceptance of **science** and medicine.'

Professor David Danks

With qualifications in law and medicine, Sommerville is concerned that policies need to be made quickly to consider rapid developments – especially in the medical arena. A subscriber to Hollingworth's brand of 'secular spirituality' which allows space for human response in the decision-making process, Sommerville says: "We don't analyse the cloak of good over scientific experiment nearly deeply or precisely enough. We forget how quickly we lost the awe and the wonder and the shock at these things we can do."

It is not surprising that 'techno-ethics' has emerged so strongly in the medical field, given the direct impact of research and development in such fields as genetic engineering and drug therapy. Chemotherapy, radiation treatment, IVF and drugs that prolong life are now well entrenched in a medical mythology that is still very much pro-life.

However within such programmes there are hypocrisies and inconsistencies. As geneticist David Suzuki stated back in 1990: "The imperative to fight death at all costs cannot stem from some profound commitment to the sanctity of life. If it did, doctors could not possibly support the current levels of abortion for reasons that have nothing to do with the health of the woman or the foetus. Aiming for life at all costs, regardless of its quality, simply does not take into account the reality of today's technologically sophisticated world."

While medical ethicists occupy an important position in the raised consciousness of progressive research, their opinions and power of attorney must also be seen in perspective. There are those who consider ethical committees to be the bane of the scientific community and, through their comprehensive methods of scrutinising research, actual inhibitors of useful work.

Professor David Danks, director of research into birth

defects at Victoria's Murdoch Institute expresses anger towards bio-ethicists and the media for sensationalising science and instilling fear in the public with fantasies about scientific research as the mysterious and sinister experiments of a bunch of rogue Dr Hydes:

"Medical ethics committees have been a very serious problem to our society," says Professor Danks. "They've been responsible for a lot of the decline in understanding and acceptance of science and medicine. They've stopped quite a bit of good research because of the cumbersome nature of getting things approved. We need to remember that scientists are also human beings – there is a tendency to assume that scientists cannot see their work from the perspective of a layperson."

The growing appreciation of the interrelations between different fields – a consciousness of the larger scheme of things – has become inherent in contemporary research. According to Hollingworth: "Today you have to be both a generalist and a specialist. Scientists can't just be pure scientists; they have to be thinkers and philosophers as well."

Danks concedes that regulations must be set for research in highly experimental and costly areas such as gene therapy. However he believes that scientists are very much aware of the broader framework within which they are working and of the difference between laboratory animals and human 'guinea pigs': "You have to distinguish between research and application because research may produce information that society regards as inappropriate. One needs to have a means of 'putting on the brakes' at the point of application of knowledge." In this he stresses that research into such complex areas as genetic manipulation is "still at the embryonic stage".

Dr Michael Georgeff, director of the Australian Artificial Intelligence Institute (AAII), also emphasises that advanced applications of any form of technology – whether gene therapy or intelligent machines – are still a long way off in the future. Currently AAII is not accountable to ethics bodies such as those which regulate Danks' work, however Georgeff agrees that the question of morality will be a paramount concern in the future.

"There may come a time when issues regarding whether intelligent machines have a 'mind' arises," he says, "but this is so far off that the technological applications of artificial intelligence today are no different from anything else in computing or any other technologies. Eventually it may be that computers have developed to such a level that we really do have to consider the morality of using them in certain applications. "With intelligent machines people need to be aware of what we have them controlling. It's important one knows whether the machines have complete control and how reliable they are."

'We can't **afford**, as scientists or as persons, to lose that **deep** sense of the mystery of life. We should act with due **regard** for the fact that ... we never absolutely **know** what we're doing.'

Margaret Sommerville.

Hollingworth, Danks and Georgeff all place blame on the media for the distortion of science fact into science fiction which, paradoxically, draws public attention to the issue of advancing technologies, and gives an incorrect impression of what is being accomplished. Science fiction cinema often presents the evil potentials of science through futuristic visions of a bleak, grey 'underworld'; devoid of compassion and joy. Danks laments media coverage and an entertainment industry which "only sees the sensational as interesting. "What most scientists do all the time is fairly ordinary, low-risk, moderate-usefulness sort of activity."

Hollingworth readily acknowledges the ubiquitous authority the media now represent but envisages a more educational role in the future: "The media has to play an increasingly important and responsible role, moreso than it does at the moment, so that people are able to make decisions on the basis of sound information."

There is a consensus among many thinkers and scientists that the communication of factual information will be crucial to the successful development of contemporary technologies. There is also a bleak vision of the future in which human dignity and equality suffer at the hand (or mechanical arm) of technological change – as Georgeff predicts: "as machines take on more control of air traffic, or running power stations, it will be a real challenge to keep the human understanding to be such that if something goes wrong with the machine or it does give incorrect advice, the humans can take over – there is a real deskilling problem."

However he stresses that: "none of the applications that AAII are working on are justified on the grounds of saving labour. Non-computer machines are much more likely to replace humans and have an impact than most computer technology. If anything the introduction of computers makes for more jobs via new services and capabilities."

Hollingworth agrees, despite anxieties about a future technologically-literate job market discriminating against a large 'uneducated' portion of the community: "We must develop brain-based industries as our best prospect of generating wealth in the region. But there will be many who won't be able to participate. There's a very important social policy that needs to be formulated."

As the Rector of The Vienna Academy for Global and Evolutionary Studies, Ervin Laszlo, advises in *Visions for the 21st Century*: we need to nurture "respect for the balances and thresholds that are vital to the integrity of nature and the future of humanity". ●

A Dandy Future

Madonna and Isabella Rossellini in the book 'Sex'. Photography by Steven Meisel, published by Serker & Warburg. rrp $50.95

Madonna and Wilde, Dracula, decadence and the whole damned thing. The fears exploding in society on the eve of the coming millennium have much in common with those of last century. Catharine Lumby explores the issues of sex, gender, family and the end of the world.

As they cross the courtyard to its entrance, visitors to Paris' George Pompidou Centre pass below a strange electric clock. Since 1987 the Genitron has kept a silent vigil over the dying years of the second millennium, counting down the number of seconds left in the 20th century. An undeniably morbid time-piece, the Genitron reveals something which is hidden behind the face of other clocks – the human propensity to measure time in terms of what is left.

In her study of late 19th century gender and culture, Elaine Showalter argues that the terminal decades of centuries have come to symbolise the death throes of a diseased society and the winding down of an exhausted culture. This apocalyptic frame of mind, Showalter says, expressed itself in the form of a backlash against socially progressive trends – the liberties of women and gays – in the 19th century: and it is doing so again in the 20th century. Her thesis is supported by the resurgence of conservatism in the 1980s; expressed popularly in the renewed fight against abortion, promiscuity, fears about the changing roles of women and men, the much vaunted demise of the family and a backlash against homosexuals in the wake of AIDS.

The recent public debate over the Federal Government's decision to allow homosexuals to serve in the Australian Defence Forces highlights the nature of contemporary community fears and prejudices regarding homosexuals.

Whether one agrees with these assertions, it is hard to dismiss the powerful parallels her book presents between the last decades of the 20th century and the concerns and themes which obsessed Western society in the closing decades of the 19th. Urban homelessness, sexually transmitted diseases, the sexual abuse of children, the social rise of women and homosexuals, drug and crime epidemics, the decline of religious values, the degradation of nature – the themes of our newspapers and current affairs programmes might have been lifted directly from the pages of newspapers and journals of the 1890s.

The term *fin de siecle* was coined in the 1880s to describe the growing apocalyptic perception of a diseased and decadent society on the brink of self-destruction. It was a period, according to historian Karl Miller, when: "Men became women. Women became men. Gender and country were put in doubt. The single life was found to harbour two sexes and two nations."

Miller's comment summarises concerns repeatedly expressed by writers, politicians, lawyers and clergy of the day – that the family unit and, by extension the social fabric itself, was being eroded by two dark and unruly social forces: women and homosexuals.

Notably, it was during the last decades of the 19th century that the terms feminist and homosexual first came into common usage. By the 1880s, the feminist movement had achieved significant reform legislation and was beginning to lobby strenuously for admission of women to higher education institutions. A growing number of women were forsaking the domestic bliss of married life for bachelorhood and more intellectual pursuits. The feminist threat was symbolically represented in the numerous portraits of decadent *femme fatales* in the art and literature of the time – from Bram Stoker's *Dracula* to Sir John Millais *La Belle Dame Sans Merci* – images of cold, ruthless and narcissistic women abound.

At the same time, a male counterpart to the New Woman was evolving; the Dandy or aesthete, an avant-garde figure who rejected the bourgeois masculine role for the pursuit of sensation, imagination and art. The effeminate dress and 'unmanly' interests of the aesthetes brought accusations of perversion – a notion confirmed in the public consciousness when the figure head of the movement, Oscar Wilde, was tried and convicted for homosexuality in 1895. Foreshadowing the views of NSW MP and man of the cloth, Reverend Fred Nile, one British clergyman warned that, "If England falls it will be this sin and her unbelief in God that will have been her ruin".

While they had little time for each other, emancipated women and the Dandies were linked in the public mind by their tendency to redefine traditional gender boundaries. As a *Punch* epigram of 1895 noted, this redefinition, even by minority groups, was a cause of extreme anxiety to the ruling patriarchal culture: "A new fear my bosom vexes/ Tomorrow there may be no sexes".

Following the frenetic social revolutions of the late 1960s and '70s, a similar epidemic of anxiety over social change has been detected by a range of contemporary commentators. In her recent book, *Backlash*, Susan Faludi argues that media and popular culture have been expressing an accelerating level of angst about the impact of feminism for the past decade. She argues: "This bulletin of despair is posted everywhere – at the newsstand, on the TV set, at the movies, in advertisements and doctors' offices and academic journals. Professional women are suffering 'burnout' and succumbing to an 'infertility epidemic'. Single women are grieving from a 'man shortage'. *The New York Times* reports: Childless women are 'depressed and confused' and their ranks are swelling. *Newsweek* says unwed women are 'hysterical' and crumbling under a 'profound crisis of confidence'."

It is not difficult to gather a wealth of similar reports in Australia. The Clemenger advertising group summed up the mood of numerous media features in its recent national report *MsUnderstandings*.

A number of commentators have also noted an increase in violence and discrimination against the gay community since the mid-1980s. President of the Anti-Discrimination Board and instigator of pioneering reports into discrimination against the gay community and HIV-related discrimination, Steve Mark, says there is no doubt that the AIDS virus has accelerated discrimination. "In the short-term, HIV has exponentially increased discrimination against homosexuals and set community acceptance back quite some way," he says.

The recent public debate over the federal government's decision to allow homosexuals to serve in the Australian Defence Forces highlights the nature of contemporary community fears and prejudices regarding homosexuals. The main reasons given by critics for opposing the decision were that it would result in a loss of morale, potential sexual harassment of heterosexual co-workers and an escalated risk of infection from the HIV virus. In reality, none of these concerns stack up. The moral argument relates directly to the existing prejudice of army recruits who can (and arguably should be) educated to reassess their discriminatory views. The sexual harassment argument ignores the data which show that heterosexual male members of the army are the worst offenders in this regard and the issue of HIV fails to acknowledge that the virus itself does not discriminate – heterosexuals as well as homosexuals are potential carriers. As Canberra journalist Margo Kingston noted in *The Age*, the real and unstated threat at the heart of the furore is an 'attack' on traditional boundaries of mateship and masculinity.


Fatal Attraction

While the Federal Government's decision illustrates the vast improvement in civil rights for homosexuals over the past century, sections of community reaction demonstrate the enormous anxiety any threat to the tenuous boundaries defining heterosexuality and masculinity still generates.

On the broader political front, the 1980s saw the ascendancy of the New Right, which brought with it, in varying degrees, a renewed emphasis on maintaining the nuclear family as the basic social unit. In the US, the alliance between Republicans and Christian fundamentalists gave birth to well-organised campaigns against abortion, pornography and equal opportunity legislation. Direct appeals to similar values in Australia – epitomised by John Howard's late 1980s campaign – were less successful. Indirectly, however, the current Coalition policy has the potential to reinforce traditional gender roles via cuts to social infrastructure and indifference to affirmative action style equal opportunity principles.

But conservatives have not been alone in their concerns about social instability. The left has bred its own share of crusaders, with an influential section of the feminist movement campaigning strenuously against a perceived tidal wave of pornography and objectification of women in movies, ads and pop video clips. In their annexation of a high moral ground for women, these feminists have arguably bought into some of the central conservative territory: an emphasis on censorship, monogamy, maternity and the construction of men as fundamentally different to women.

Anxiety generated by the challenge to the nuclear family unit and the burgeoning sexual and professional expectations of women have been marketed through a series of Hollywood films. The 1987 box office hit *Fatal Attraction* led the way with a cautionary psycho-killer tale for career women – as one film critic stated: "*Fatal Attraction* confirms the patriarchal fantasy that made clitoridectomy a 19th century cure for hysteria, that the sexually eager woman is just a gasp away from the castrating Medusa, the murderous phallic mother, and that if sex is not contained by marriage, it will be the end of civilisation as we know it." Films such as *Cape Fear* and *Patriot Games* continued the theme, pitting husbands and fathers against dark anarchistic forces out to destroy the family unit.

> **"*Fatal Attraction* confirms the patriarchal fantasy that made clitoridectomy a 19th century cure for hysteria."**

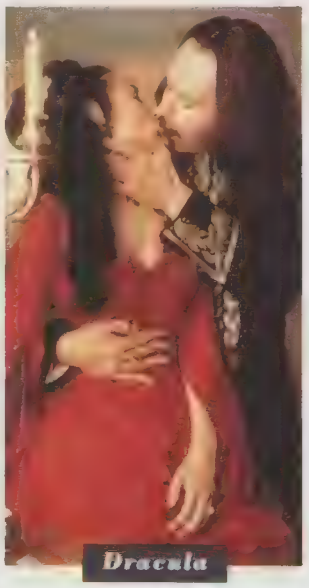
More recently, Francis Ford Coppola's *Dracula* zeroed in on the 19th century *fin de siecle* roots of the fears identified by Elaine Showalter. Faithful to Stoker's 1897 novel, Coppola recasts the contemporary drama over shifts in boundaries containing gender and sexuality in a 19th century format. The juxtapositions are familiar: the civility and order of democratic Britain versus the unknown, barbaric terrain of the East; the purity and innocence of English maidens versus the corrupted, homicidal lust of women who have tasted sexual passion; the virility of Christian patriarchy versus the pale, foppish slipperiness of an enemy whose identity is so changeable he can transform himself into fog.

Unlike the *Fatal Attraction* genre, however, *Dracula* evinces a more sophisticated grasp of its subject matter. Coppola allows himself more than a directorial wink in the direction of the dark, malevolent forces he depicts. Dracula is ultimately portrayed as a sympathetic character with a greater appetite for life than the heroine's insipid fiance. As Winona Ryder observes drily of her life when Dracula announces she must die before they can be united: "I don't care. Just take me away from all this death".

If cultural insecurity in the 1890s flowed from social changes made possible by the Industrial Revolution, anxiety in the 1990s targets lifestyles and views made possible by the transport and communications revolution. It is a crucial difference – one that distinguishes the two eras and offers a new framework for analysing our current fears

about the future of society.

The moral panic surrounding the latest Madonna offering, a book of soft core pornographic photos titled *Sex* is a case in point. The book contains coy and highly stylised images of homosexual foreplay, sado-masochistic role-playing, group sex, masturbation and exhibitionism. Barely nodding towards the hard core, it is not dollar-for-image good value pornography – indeed, far more sexually explicit images are routinely available in *Penthouse* and *Playboy*. Pornography is, however, not the issue. At the heart of the matter is a panic about regulating information flows; Madonna's book, due to the star's popularity, represents the incursion of 'Pornography' into the 'Mainstream'.



Madonna is a celebrity who understands the stuff celebrities are made of in a way few stars ever have. As someone who has successfully reinvented her own image dozens of times, Madonna intuitively understands something important about the circulation of images in popular culture and, by extension, about identity in modern society itself. In a world of infinite images, consumers are offered an infinite number of projections of reality. The gap between appearances and reality has narrowed to an imperceptible level.

By presenting the world with a range of sexual fantasies in which she poses successively as aggressor, victim, exhibitionist, housewife, gay and straight, Madonna is suggesting there is nothing essential about gender or sexuality – and by implication identity. As a sexual object who is also subject – a woman who controls and determines the circulation of her image and her fantasies – Madonna takes us to the heart of contemporary fears about social disintegration.

It is the unprecedented circulation of images and information, made possible by the communications revolution, which has fuelled the rapid social changes of recent decades. Indeed, widespread access to information and images of alternative lifestyles are central to many of the demands and achievements of the women's movement and similar movements for social liberation. It is this access, one which eludes traditional systems of social surveillance, which marks the difference between fears underlying the late 19th century *fin de siecle* mentality and that informing today's concerns.

Perhaps the real challenge behind the perceived threat of social change, then, is a technological one. How can a stable social identity be retrieved from behind a proliferation of alternative images? Clearly, given current technology the dream of containing the flow of images and information must rate as the biggest fantasy of all.

Apocalyptic thinking about society, then, may ultimately tell us more about the structural forces shaping our future than its yearning for the past suggests. There can be no doubt that the parallels between the final years of the 19th and 20th centuries bear some striking resemblances in attitudes and activity. If one considers the impact of the *fin de siecle* on the 20th century, one can only wonder on how today's fears and fascinations will help shape the 21st. ●

The deputy director of research at the Australian Family Institute of Studies, Peter McDonald, notes that the late 1960s and 1970s were a period of radical social change in the Western world:

"It was a period marked by the rise of women's liberation, the rapid spread of effective control over fertility, availability of abortion, the rise of divorce and live-together relationships, the associated decline in the breadwinner model of the family, a declining birthrate, freer sexual relationships, tolerance of homosexuality, delayed marriage, and the emergence of the legitimacy of being single."

Divorce, non-marriage and childlessness, McDonald points out, had all been regarded as socially deviant behaviour, even by professional psychologists, in the era of familism which followed World War II.

So what of the Australian family's future? McDonald argues that the social ferment leading up to the 1980s was tempered by a conservatism that flowed from the economic malaise of the early 1980s. As a direct result, he says, the pace of social change slowed and the decade became a testing ground for measuring the viability of gains made during the late '60s and '70s. His broad conclusion is that the changes have been sustained although few new directions have emerged in the past decade.

Looking to the year 2000, McDonald argues that the key factor in family structure will be the economy. He says: "Changes in the 1970s were related to changes in attitudes and values rather than being driven by economic changes. Those changes of attitudes and values seem to have been sustained in the 1980s, but during this period the economic pressures on family formation have increased. If change occurs during the 1990s, it is likely to be more related to economic pressures than to radical changes in values." ● Catharine Lumby's last feature for *21.C* was on the future of Cambodia.

In Your Face!

COMPUTERS AREN'T JUST FOR MONDOIDS AND TECHNOFREAKS. JEN ST. CLAIR INTERFACES WITH SOME USER-FRIENDLIES.

The human-computer interface is where you and a digital device meet. That meeting may feel more like a head-on collision than a friendly tête-à-tête when the device is a VCR and the task is programming the timer, but even that's changing. Computers at last seem to be getting, if not exactly friendly, then at least tolerable. The credit for this change is due in part to work in a new cultural/technical niche: HCI, or human-computer interface.

For the past decade, HCI has been an interdisciplinary margin where psychologists work with computer programmers, where graphic designers rub shoulders with semioticians and where sci-fi writers witness the birth of their fantasies. So rapid has been the growth and development of this human-computer interface, that even the term "computer" has somehow been overtaken by events. A computer started off being a *person* who did manual calculations, then became an electronic device that did the same thing, but at extraordinary speed.

The reality of computers has sprawled like lava, fast and further, over and around the petrified popular conception of those grey and beige boxes that hum on desktops. These days computers help us drive our cars, cook our food and manage our money. They are *everywhere*. The computer has insinuated itself into almost every corner of postmodern life and, to use Marshall McLuhan's term, the computer has become a fully-fledged medium, taking its place alongside the media that have revolutionised our culture in the past: print, film and television.

This new medium is luring artists into the computer lab and tempting technicians to cross the disciplinary lines into explorations of time, memory and mathematical beauty. Electronic art is making us ask questions about what it is to be organic, about a cyberculture that calls human bodies "wetware". So if the insidious spread of computers has ever creased your brow with concern ("What's *happening* to people? Where is all this *leading*?") the place to go for answers is 'The Interface'.

However, here at this wild frontier where C.P. Snow's *Two Cultures* collide, it's all too new to know for sure what makes a 'good' interface – not only ergonomically but also socially and in interpersonal terms. Within the confusing entrails of a dying industrial state, HCI is where the future is taking shape. For better or worse.

The one thing that all HCI practitioners agree about the interface is that when it works well, it is transparent. We aren't even aware of it. George Orwell acknowledged this media characteristic when he said: "Good prose is like a window pane". Mark Weiser of the Xerox PARC Computer Science Laboratory presents the same idea, different medium, half a century later: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."

So, if indeed this electronic medium we dub so simplistically "computers" is disappearing from our perception as the interface becomes transparent, then the implication is that the interface between us and *it* is growing all around us – and omigod, even inside us.

One contemporary McLuhan scholar, Derrick de Kerkhove of Art Futura, puts it like this: "computers have created a new kind of intermediate cognition, a bridge of continuous interaction and exchanges between the outside world and our inner selves".

The interface between us and it is growing all around us, and omigod, even inside us.

Predictions about the way this "bridge of continuous interaction" will change our way of life are hard to come by – except from sci-fi writers like William Gibson whose vision of the future currently seems futuristic, but only just. The really weird thing though is not the HCI fiction, but that people are now creating something approximating Gibson's 'cyberspace' – the thus far fictional space within the computer software where the potential exists to travel and transact. The magazine for the techno-avant-garde, *Mondo 2000*, reports the development of the Maelstrom, "a multi-user fantasy role-playing game complete with graphics and sound".

One of Maelstrom's authors, Patrick Kroupa, tells Mondoids: "We wanna amass all humanity to party. The intent is to bring together artists, scientists, musicians, politicians, writers – to form a critical mass, for an explosion of information and ideas."

How did humanity get here, to this interface with a future we barely recognise, a future that is already more *present* for the MTV youth subculture than full employment or a rural idyll will ever be?

ILLUSTRATION: IAN HAIG

If the insidious spread of computers has ever creased your brow with

concern the place to go for answers is the wild frontier of 'The Interface'.

50 million fans can't be wrong

The reason for computer hardware's spectacular spread is threefold: First there is scale: spectacular reductions in hardware size, from room-sized monsters to pocket-sized pets. Second is speed: digital signals travel faster around miniaturised circuits so we enjoy almost instantaneous responsiveness. The third point is price: the improved cost-effectiveness of computerisation has made it accessible to a new generation of non-technical users.

Since the early '80s, IBM's PC and its many clones have helped us get used to the idea of personal computing. The next step was what the "father of personal computing", Alan Kay, called intimate computing. He first envisaged this as a Dynabook – a concept now brought to the marketplace as Apple's digital assistant, the hand-held, keyboard-free Newton. But what comes after intimate computing?

Mark Weiser, of Xerox PARC, foresees a world of ubiquitous computers, which he says are "not just computers which can be carried to the beach, jungle or airport". He explained his view in *Scientific American* in 1991: "Consider writing, perhaps the first information technology. The ability to represent spoken language symbolically for long-term storage freed information from the constraints of individual memories. Today this technology is ubiquitous in industrialised countries... Silicon-based information technology, in contrast, is far from having become part of the environment. More than 50 million personal computers have been sold, and the computer nonetheless remains largely in a world of its own. It is approachable only through complex jargon that has nothing to do with the tasks for which people use computers.

The state of the art is perhaps analogous to the period when scribes had to know about as much about making ink or baking clay as they did about writing."

Weiser admits that trying to predict the future that this ubiquitous computer interface will create is "like trying to predict the publication of *Finnegan's Wake* shortly after having inscribed the first clay tablets". ○

The changes that are happening on both sides of the computer-human relationship offer some *clues*. But the chilling lesson that HCI's history teaches is an echo of Margaret Thatcher's dubious catchcry of the '80s: TINA. There Is No Alternative. Like it or not, changes in hardware are driving changes in software which are driving changes in HCI which are driving changes in *us*. Because what alternative is there to a techno-future – and anyway why would the juggernaut change direction now? (A global silicon shortage? Forget it – it's the second most abundant element in the Earth's crust...)

In this maelstrom, there are few HCI practitioners who will face the big questions about where the interface is going and how it will take us all there. The academics and corporate researchers who gather at ergonomics and human factors conferences tend to focus on nuts and bolts questions like the meaning of colour in screen displays and whether visual icons communicate better than text labels (someone has to do all that stuff...).

But people working at HCI's own ragged fringe are bolder: take Manuel de Landa, author of *War in the Age of Intelligent Machines* who has been described as a "techno-Foucault". He speculates that "consciousness can be an emergent property that can skip the organic and go into silicon – perhaps via us. We might just be insects pollinating machines that do not happen to have their own reproductive organs right now."

Well maybe, maybe not, Manuel. But at least you're game to speculate. However one consistent reference is to the work of a woman: Brenda Laurel. At last year's Sydney TISEA (The Electronic Symposium on Electronic Art) Laurel was credited simply as "VR writer". That means she creates virtual worlds. Not your average nine-to-five job.

In 1989 Laurel edited a book called *The Art of Human-Computer Interface Design.* Here, at the suggestion of Apple computer's human interface group manager, Joy Mountford, she gathered the collective wisdom of everybody who was anybody in the HCI realm. It was in these pages that Laurel developed the theme of *Agents* – intelligent assistants written into the interface to get things done for us. She is not the first to introduce this notion, or even the most radical, but somehow her background in theatre and drama manages to make her a do-er rather than a theorist and gives her a reputation for creating innovative HCIs.

When she's not designing worlds, Laurel spends time flying and postulating on the global conference circuit. At the second international cyberspace conference she described a virtual environment called Habitat and recounted early unrest among Habitat's participants:

"Criminals were afoot, stealing people's heads. When you first log on to Habitat you get to choose a body (and therefore a gender) and then you go to the Head Shop and buy yourself a head. In the early days, when you logged off from a session, your body would stay where it was. Part of the fun was wandering around trying to figure out which bodies had somebody 'in there'."

Lost in hyperspace

The dramatic arts are full of promising ideas for interface design, according to Apple's Joy Mountford: "Drama has the power to *engage* audience members both emotionally and cognitively". A recent Apple design project, Guides, demonstrates an engaging way of searching an educational database.

The researchers collect text, graphical and sound data about American history from 1800 to 1850 and set out to structure it innovatively using multi-dimensional 'links' or Hypertext.

The classic dilemma for Hypertext designers is that of users "getting lost in hyperspace". In the Guides project the creative solution is a range of travel guides, such as a native American Indian, a woman settler in the Wild West and a slave. These all offer distinctive pathways through the body of knowledge based on their own "point of view". At each juncture in the narrative, the reader is offered a reasonable "next choice" as an alternative to free browsing.

The authors "encourage people to work out how the articles interrelate and to figure out connections... Children often assume educational material is objective and comprehensive, but in fact any encyclopedia has a particular perspective. Guides suggest a natural way to present multiple voices, placing users in a position to draw their own conclusions." ○

Apparently, when head-stealing became rife, participants lobbied the software designers for a code rewrite to make the offence punishable by "confinement to quarters" for several hours of log-on time.

When Laurel described this spontaneous electronic democracy to the cyberspace conference she was challenged by a woman in the audience, who asked what people were doing to make cyberspace more accessible to the marginalised: to women ("classically disenfranchised in the techno-domain", according to Laurel), to minorities, and to Third-World cultures. "I had to think carefully about my response," says Laurel. "First of all I reminded her that I was a woman (I believe my exact words were, 'What am I, chopped liver?') and that one way for women to get into cyberspace was to do what I had done – get actively involved in the industry rather than sitting on the sidelines waiting for somebody else to make the way smooth.

"Then I asked her what she had in mind as far as the other groups she mentioned were concerned. Should First-World white heterosexuals build little virtual terrariums for blacks, Latinos, gays and lesbians – based on their own ideas of what such cultures are like, saturate them with their own liberal hidden agendas? I wondered if she wasn't preaching to the wrong group. Shouldn't she be evangelising with the marginalised themselves to persuade them to co-opt the technology?"

Here Laurel focusses on some specific issues: How can we empower people through global technology without sacrificing cultural diversity? How do we empower people to use computer technology without confining them to the Western constructs that are deeply embedded in our interfaces, computer languages and the architecture of the technology itself? She hints at one humane way forward when she says, "A person ought to be able to be both an 'author' and a 'reader' in any given medium". In other words, move over DOS-jockeys, the rest of us are going to have a go...

All this may sound a million miles from the world of the cryptic, user-vicious interfaces that have grunted error messages like "Bad command or file name" at us for 10 years now – but it's not a million light years away. In fact, Brenda Laurel's message from the furthest-flung frontier of the human-computer interface is that the technology is in place, right now, waiting to be co-opted by any of us (although perhaps not all: how many cyberpeople can this planet stand?).

The alternative is co-option, by *it* of *us*. ●

Engineers vs artists

Computers' growing ubiquity means big changes for and in human users. Software developers can no longer assume that end-users share their conceptual understanding of technical processes. Hence the new discipline of HCI, with its attempts to bridge the gap between engineers and everyone else. There is also the availability of software development tools which no longer require high-level programming skills – or in some cases, no programming skills at all – has placed the power to create software in the hands of non-specialists for the first time.

These changes mirror the way that film-making changed from being the preserve of the engineer, like Thomas Edison, to the domain of the artist. Paul Heckel, software design pioneer, told his readers in *The Elements of Friendly Software Design*: "For several years, Thomas Edison controlled film-making. He did not see the artistic possibilities of the medium and stubbornly fought against Edwin S. Porter who wanted to make films that would tell stories... Movies did not flourish until the engineers lost control to artists – or more precisely, to the communications craftsmen. The same thing is now happening with *software*." ○

The Tomes are a-Changin'

DARRYL RIBAUX FLICKS THROUGH THE ELECTRONIC PAGES OF THE NEW MEDIA

If the word ever comes down from the mount again, you can bet that it will be etched not on stone tablets but on compact disk. Electronic publishing is changing not only the way we access hard information such as data and statistics, but how our literary culture is written and read. It means that, in the future, our concept of 'the book' is going to undergo some definitional shifts.

How will the change to electronic or digital formats affect our reading and writing habits? At the moment, most people would prefer to curl up on the couch with a paper book rather than try to read one from their computer screen – for the very good reason that a paper book is less cumbersome. But what if a more convenient electronic text reader can be found – say a hand-held one that doesn't cause eye-strain and can manipulate the size of the print according to the reader's desire?

Generations of people who grew up taking for granted that a book is as the once paper-based Oxford English Dictionary states "a portable written or printed work filling a number of sheets fastened together... and enclosed in cover", may have to learn to enjoy lying in bed with their laptops or else miss out on the latest releases. Now even the venerable old Oxford is also available on CD-ROM, the format that is set to replace paper.

As William Gibson points out, "libraries are large buildings full of (literally) decaying vegetable matter. The great bulk of what we publish on paper should be published electronically, if only for ecological reasons."

◆ WRIT ON ROM

The book as we know it in its modern format, superseded the parchment manuscript because it was cheaper to produce, more portable and therefore, more accessible. Modern printing and its bound paper product allowed knowledge and information to travel faster and move from the local to the global.

Electronic publishing is the next major evolutionary stage. It changes not only the format and material basis of the book, it challenges the notion of the book as primarily text-based. Most of the developments in electronic publishing at the moment stem from the possibilities offered by multi-media applications. The electronic book is different because it can fuse sight, sound and text. But for such a format to become commercially viable a way was needed to store massive amounts of text and images on the personal computer. The CD-ROM disk and drive were the answer.

At present, the books being digitally published are usually reference books. It makes sense to store multi-volume dictionaries and encyclopedias on CD when a 12.5cm CD-ROM disk can hold 250,000 pages of text. This type of information also seems inherently suited to electronic format and access. When most people pick up an encyclopedia (if they can) it is usually to look up a specific topic and not to read the 26 volumes through from beginning to end. 'Hard' information like this can be presented on disk without much need to worry about the niceties of narrative integrity.

Another advantage to this electronic format, as science fiction author William Gibson points out, is that "libraries are large buildings full of (literally) decaying vegetable matter. The great bulk of what we publish on paper should be published electronically, if only for ecological reasons. I suspect that one day a library will simply be something on the other end of a modem." As long as it is indexed properly and can be retrieved easily, who cares where it is on the disk. It is information that needn't be presented between cloth covers.

Other obvious applications for electronic publishing are manuals, educational and travel books. One example of what is currently available in Australia is a CD-ROM book titled *Bach and Beyond*. To use it requires a Macintosh computer and Hypercard program. This CD book is an interactive survey of music from Bach and Handel to the present day. Rather than flip pages, the reader moves back and forward through the book – which is not only illustrated but talks – with the help of icons and a mouse. The reader's path through the book can be marked with electronic paper clips and retraced later on. The book also has boxed song titles that when selected play the music. There are catalogue cards which enable searches to be undertaken by composer or performer name and the cards can be modified by the reader by copying the CD book to the computer's hard drive so as to be able to write to it.

◆ THE END OF THE WORD AS WE KNOW IT?

But what of that privileged form of text known as 'literature'? How might digital formats change the reading and writing of the novel? Is it the end of the word as we know it? How will it affect the way we look at Homer, Shakespeare and Dickens?

For a start, new marketing strategies will have to be developed. What attracts many people to a book in the store is its cover. Disks will have to be packaged similarly. At the moment, very few bookstores stock CD or floppy-disk books.

As Victor Zalakos, marketing manager for Firmware Design who distribute electronic books, acknowledges, "It is very much a niche market at the moment. The majority of sales are going through the traditional computer retailer rather than bookstore. This is due in part to the volume of sales at the moment, and the need for hardware backup." William Gibson, who has three novels published on disk [see box on this page] told *21•C* that he hasn't actually used the electronic edition of his novels yet because his MacSE30 can't run it. This raises the issue that readers may need to be convinced of the ease of use and in the case of art books, for example, whether the reproductions are adequately detailed. This requires in-store opportunities for people to view the books on a computer screen. It also requires that formats be unified.

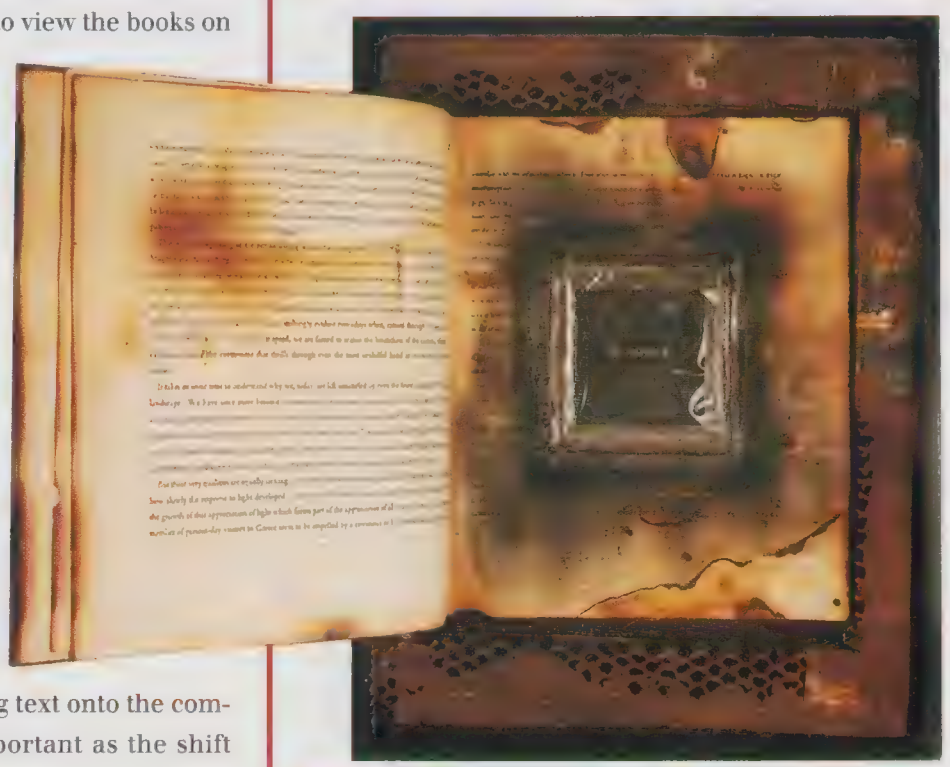
Madame Bovary, *Brave New World* and the William Gibson cyberpunk novels *Neuromancer*, *Count Zero* and *Mona Lisa Overdrive* (all on one disk) are fiction titles that are on Expanded Books produced by the United States company, Voyager. They are a range of books on floppy-disk, designed for use on the Macintosh PowerBook. Voyager states that they "were unwilling to cede the future of communication to MTV and wanted to explore the ways in which computers could be used to enhance the experience of reading.... Our instincts told us that getting text onto the computer in a readable form may be as important as the shift from scroll to the bound book."

These books do not offer the sight and sound of many CD-ROM books but do have elements the paper based novel never could. Notes can be typed and erased in the margins of the page and passages underlined or made bold. If you are on page 220 and a character has appeared after an absence of a few hundred pages, you can point your mouse to the character and ask to be taken back to where s/he first appeared. Great for who-dunnits and Gabriel Garcia-Marquez novels. Once you close the book, an electronic book mark is activated for that page.

Victor Zalakos adds that "in order to succeed, the electronic book needs to offer something that the traditional book doesn't, such as the annotated section in the electronic edition of Susan Faludi's *Backlash* where you click on to a phrase and are then taken to the annotated section for explanation".

Despite the momentous changes, the paper book format has not been done away with entirely – the Voyager disks are packaged in a mock-up of a book cover, while a CD-ROM version of Edgar Allan Poe's *The Tell Tale Heart* produced by Discis, frames the text within an image of an open book. The text on the screen is arranged within a double page spread. However, it differs from the traditional text by having the ability to read itself aloud and define words in the story upon request.

Self-publishing will also be easier with an electronic format. A person can write their book to disk and make relatively cheap copies (of course, the problems of distribution, marketing and getting a review will remain the same – most people will still need to find a publisher). Voyager actually offer an electronic book toolkit in which the program allows you to import text, make chapter headings, contents pages and set up page marking and a word search capability – hey presto, instant book.



'Dead' Book Suicides!

Perhaps unsurprisingly one of the extreme new forms of computerised literature has already appeared courtesy of cyberpunk guru, William Gibson. Gibson's *Agrippa (a book of the dead)* was written specifically to be read on computer disk – and to make sure it remains that way it comes complete with its own suicidal virus, guaranteed to destroy the book as it is read. Illustrations accompanying the disk are just as much fun, disappearing after being exposed to light. The privilege of this futuristic indulgence ranges in price between $450 and $7,500.

◆ REWRITING READING HABITS

Will literature be regarded as just another form of data to be manipulated and will our reading habits change? A work of fiction is usually read from beginning to end, but the way in which people access hard information may flow over to the reading of the electronic novel. Antoni Jach, teacher of creative writing at RMIT and the editor of *Modern Fiction* magazine believes that some people already read novels in this way. "Some people read fiction books for information content... they will read a 500 page book and they'll be enjoying it, but if you tell them what happens at the end, they'll stop

reading because it seems that what they want from reading is to find out about a series of completed actions – who does what, who lives, who dies. People read for data collection and often they don't even notice."

People may become so used to multi-media sight and sound additives in things such as encyclopedias that they will eventually demand them in their novels. Yet part of the power of the written word is its ability to let different readers conjure up different images from a text. Images may be provided with the text and may in a sense dictate what the reader can imagine. Could it be that electronic multi-media books will in their own way, set things in stone?

"Multi-media books," Antoni Jach says, "could limit responses to a text by presenting a very specific image of say the witches in Macbeth [but] it is similar to film. Sometimes when you are watching films you think, I didn't imagine it to be like that. I didn't expect the characters to look like that. But it's the same kind of issue. You're given an interpretation on film and the presentation on CD-ROM or disk would be similar. You're being given another interpretation."

Likewise, novelists themselves may change to meet the challenges and possibilities of digital formats. New ways of structuring prose may evolve that bypass the traditional linear narrative. As Victor Zalakos points out, "people are only starting to write for the new formats. At the moment, those involved are trying to duplicate what a book does in order to attract people and get them interested – later on people will begin writing specifically for the new media." Hypertext is being touted as the way to do this.

With Hypertext, the author sets up a multiplicity of routes or links between blocks of text or information in a data base. Rather than scrolling from beginning to end, the reader has different ways of progressing through the story – maybe following one sub-plot for a while and then making his or her way back. The order in which the story is approached can change with each reading. This type of flexibility does have its drawbacks – the reader may become lost in the text and miss sections that are important. With Hypertext the reader may end up like a dog with 10 bones, become frustrated and give up all together. Writers too might have to be sold on the idea. "I don't find the concept of hypertext-as-literature particularly exciting, either as a reader or writer," says William Gibson. "I suspect that, in a sense, all good literature already works this way. James Joyce wrote a kind of hypertext."

Electronic publishing could allow for interactive readings of a novel. If you don't like the author's idea of the world being blown to pieces, no problem, alternatives are provided. Questions to do with author's integrity will need to be asked in instances such as these. This isn't a problem for authors writing now where publication rights for CD-ROM presentation are negotiated separately, with the author deciding whether to provide for multiple readings as an original part of the work. Safeguards can be put in place. An electronic novel could be presented in a locked read-only form, or unlocked, where the reader could change parts if they wanted to. Similarly the author will have a choice with regard to images and sound. William Gibson specifically asked Voyager not to add sound or image to his texts. But what of deceased authors like William Shakespeare? Who's going to ask him if he minds a bit of messing about with *Macbeth*?

◆ A TOMB FOR THE TOME?

But does it really matter that the format of fact and fiction changes so long as the content is up to standard? Does it matter if our Ballard's and our Bibles are on CD-ROM? Are we just acting out the anxieties of previous change? When books began to be printed on printing presses they were looked down upon by traditionalists who believed that 'real' and worthwhile books were the ornate manuscripts produced in the monasteries. The arrival of the paperback also brought criticism. Never mind that it was cheaper than a hard back and more accessible to people. Somehow it was less precious and would lead to the debasing of 'culture' as we know it.

In a culture increasingly communicating in a cacophony of sound bites, disconnected images and flashing texts, it may be that the only way important ideas and cultural heritage will pass to further generations is to keep up with the changing technology. Our culture has never been sentimental when the price to be paid is convenience. Yet the paper book may not meet the same demise as rapidly as the vinyl LP. Just as papyrus co-existed for centuries with clay as did parchment with paper, the electronic book format will co-exist with the paper one.

As Antoni Jach argues: "Films didn't replace the traditional book. Yet film has been the greatest threat because it provides such an all-embracing experience – such an easy experience for readers. You can sit back in a chair and let it wash over you and it's much easier than watching it on a Macintosh screen where you've got to scroll, sit up straight – you have to concentrate. CD-ROM is just another way. People will distinguish and say that's just the CD or that's just the disk. People will choose their own reading experience."

Paperbacks and even hardback books (unlike the cumbersome, accident prone vinyl record) are still more convenient than any alternative. Paper books do not need accompanying intermediate technology to be read. As William Gibson says: "I imagine that as long as people actually read, some 'hard copy' will be manufactured. They're portable, require no batteries and you can read them in the bath."

The recreational (different from informational) reading of text will be paper bound for quite some time. If anything changes this it will be the lure of the image and sound. By then literature and the book will have been forced to embrace new definitions. ●

Note: While Expanded books are produced for use on a PowerBook, they can be used on Apple Macs which have a hard drive, large display (640 x 400 or greater), System 6.07 and Hypercard 2.1 (or later versions).

Daryl Ribaux's last story for *21.C* was on censorship in the age of information technology.


Protect
the R-Zone
Layer
MELBOURNE
PUBLIC RADIO
TRIPLE R • THE FUTURE IN BROADCASTING

Software cynic & hardware heretic: Tom Forester

INTERVIEWED BY ROBYN WILLIAMS

TOM FORESTER was an alderman in the UK and an industrial correspondent for a newspaper when he travelled to Silicon Valley and discovered 'The Chip'. Today he teaches in the School of Computing and Information Technology at Griffith University in Queensland, and is author or editor of six books on technology and society.

Somehow Forester has travelled from a chip-loving true-believer of the 1970s to the technocritic of today. That emerged via his experience of the myth of the paperless electronic cottage. Many of technology's 'great new hopes' have found wide acceptance, although often without the productivity anticipated and not necessarily with any increase in quality or savings in time. Often new efficiencies are farcically absent. Can face-to-face communication really be redundant, asks Forester? Many of the 'next big things' develop and then vanish almost without trace, he notes, recalling the grand promises of eight track stereo, the video disk, home banking, or the ill fated rival to VHS, Beta-max.

Forester's most recent publication to hit the stands, *Computer Ethics: Cautionary Tales and Ethical Dilemmas in Computing* (co-authored with Perry Morrison) is not untypical of Forester's occasionally cynical and perpetually questioning stance on technology and its impact on humankind. Unlike many 'techno-obsessives', Forester is quick to investigate such areas as software unreliability, computer crime, invasions of privacy and software theft. In his upcoming book, *Silicon Samurai*, Forester investigates the growing economic dominance of technological progress, most notably, as the title suggests, in Japan.

In the following interview, Tom Forester discusses the information revolution, warts and all, with Robyn Williams.

21•C: *Tom Forester, are you a Luddite?*

Tom Forester: No, certainly not. I don't believe in going around breaking the new machinery.

But you are rather rude about some machinery that is being invented these days.

I think I have a fairly balanced view. I'm neither a way-out optimist, nor way-out pessimist. I think a lot of people who have written about the info-tech revolution have tended to go over the top one way or another primarily to sell books – the optimists like Alvin Toffler who wrote about 'future shocks', and 'third waves' and nonsense like that. On the other hand you have critics who say that computers are going to lead inevitably to totalitarianism and all sorts of other ghastly things. So I think it is important to steer a common-sense middle course between the two extremes and analyse in a fairly sober way precisely what has happened. What has worked. What has sold and what hasn't.

You're an extreme critic of the information technology revolution.

I've tended to adopt a fairly critical pose of late because frankly I have been sick and tired of the hype and bulldust churned out by the industry itself, and indeed some academics who are keen to get research grants. So one does get criticised precisely because one's telling the truth, and the truth sometimes hurts.

What was it about Stanford and the Silicon Valley experience that made you think the world was going to change as a result of chip technology?

We had a kind of false alarm in the '50s when people made various predictions about the computer. But they were talking about the main-frame computer then, and although main-frames were put into banks and government institutions and so forth, they were still clumsy, enormously expensive things. However the microchip was something different and just the sheer dimensions of it – the shape and size – suggested that it would find its way into lots of consumer products, into office products, and manufacturing equipment and it really would have a major impact. Having said that, I must say with hindsight that we all got a little bit carried away then and it's clearly not had the impact in manufacturing and in commerce that many people believed it would have.

Do you mean it hasn't made life more efficient or productive?

A lot of the predictions made at the time suggested that by now, or – as they said then – by 1990, we would all be living in a leisure society, for example. Well far from enjoying the leisure society, those who are fortunate enough to be in work are actually working much harder than ever.

Most people complain that they haven't got time for anything, they're always in a rush, more people are doing second jobs, moonlighting and so on. So the pundits got that one wrong. In addition to that, people at that time were talking about the paperless office – now that's got to be one of the

ILLUSTRATION STUART BILLINGTON

funniest predictions.

*My office is **submerged** in paper!*

Everybody's. You cannot move. It is incredible.

Why has that happened?

We are consuming more paper than ever before. Every year we chop down more and more trees to satisfy our appetite for paper. In fact the big success stories in the office have been the photocopier and the fax – which of course consume vast quantities of paper. So the paperless office is one of the biggest myths of all time. Even now, despite 25 years of computerisation in the banking industry, something like 80 per cent of all transactions in banking are conducted using paper. I think it will decline in time, but certainly the idea that working in electronic, totally automated paperless offices by the mid '80s proved to be a joke.

the paperless office is one of the biggest myths of all time

This gives the picture of the IT industry trying to sell their products hell-for-leather and people in manufacturing, in offices, or even in homes, buying them simply because they've been pushed rather than thinking about what these things are for?

Exactly. There's a number of problems here. First of all there's all the hype in the industry itself, and unfortunately too many managers have fallen for that, partly because computer people talk in this arcane techno-babble. It's the language full of computer jargon that nobody can understand. So we found throughout the '80s managers saying, "Well I don't really understand this, but obviously computing is the way to go these days, I'll write a blank cheque, and let the techies get on with it". Now of course a lot of them are realising they have all this equipment gathering dust or being taken off to the scrap yard because they bought the wrong stuff, and paid too much for it. That's an encouraging sign of course, because it means now that managers are wising up, they don't necessarily believe all the jargon – they're asking searching questions now about the productivity pay-off. They want to see the bottom line benefits.

Do you mean my life is going to improve? Because speaking personally I'm being communicated to death. We have got the fax, which is an old technology, I think invented somewhere about 1919...

People under-estimated the market for the fax – as indeed they did for the mobile phone. Throughout the past decade or so the market researchers who talked mainly to the vendors of computer products and the inventors, and had never spoken to the consumers, tended to wildly over-estimate the market for the latest micro-widget or shirt pocket super computer, and if you pick up the computer trade press you'll see these ridiculous predictions saying the market for such and such will be 500 billion zillion by 1995, but in some cases they actually missed out on products that have been runaway successes like the fax and the mobile phone.

The reason for that of course is that both those products have an obvious and immediate use, they're very easy to use and have become increasingly affordable – and that's the test you must apply to all the new consumer electronics gadgetry.

One can certainly say that there are sensible machines that are wonderfully straightforward, if you want to send something quickly you can do that. But in my office you have faxes, you have e-mail, you have phones, and all these different machines like computers doing other sorts of communication. Why do people need to get at me so often in so many different ways? It means I can hardly finish a sentence. What I want to do sometimes – we've the privilege at the moment of having a conversation for some time – but I want to be able to exchange sentences with people, and actually finish one of those sentences before another blasted machine goes 'Beep', saying answer me, *and machines have to be answered first. You've noticed that people don't finish the conversation, they run off to service the machine.*

Well I don't. I won't have fax or even e-mail at home because I won't be driven by these technologies. In fact even the phone ringing all the time is a great invasion of privacy in many ways too. In America they've identified the problem among modern executives and yuppies, of communicaholism, people have become addicted to communicating. So you have the guy who jumps in the car having left the office – two minutes later he is on the mobile phone calling the office to see if there have been any messages left for him. A lot of people have been diagnosed as communicaholic and it becomes addictive: e-mail addicts, 'fax-potatoes' – people faxing everywhere all the time. Instead of getting up off their bum and walking around the partition into the room next door, they send a fax. A number of these problems have emerged, and I do think it is a pity that people don't take out

a lot of people have been diagnosed as communicaholics

a little bit more time for calm contemplation and perhaps that would result in better decision making.

It's the same sort of phenomenon with word processors. Various studies have shown that you use 30 per cent more words as a result of using the computer.

I don't

You don't?

No, I don't. I think some people do.

You've been trained to say that.

I actually find the word processor very useful. I find e-mail useful and use my modem and so forth, and I think that's the way to go – being selective. These tools, and they are tools, no more no less, have not transformed lifestyles in the way a

lot of people predicted, and they certainly haven't transformed society. We are not living in a totally different type of society as a result of the computer, it's just the same old society with knobs on.

In essence you call for the machines to stop running our lives, and argue that we must deal more intelligently with our technology.

I think we've got to train and educate people into more intelligent use of these machines. From the studies that have been done, people have been using PCs for quite inappropriate reasons, compiling lists and so forth, and spending hours

are we doomed to hang onto the apron strings of Sony?

and hours feeding in data. I was talking to a guy the other day who feeds all his tax returns into the computer, taking hours and hours to do that. He says he can get an instant read-out of whatever he claimed in 1989, and I said, "Well, what the hell is wrong with just going to the filing cabinet?". That seems to me to be a waste of time. There's a new word by the way for wasting time on computers, it's called 'futzing'. It has a number of definitions: one is wasting time on computers, the other is spending enormous amounts of time trying to make software work. It's a major problem in the office. A study just came out in the United States suggesting that $140 million a year is wasted with the average PC user spending something like 5.1 hours a week 'futzing' on the machine.

So if we could turn that into useful productive work we might be able to solve some of our economic problems?

Yes. Another problem is 'busy work' – people pretending to look busy. So you get this phenomenon of people sitting at their machines pretending to work. If you look over their shoulder you see they're playing a game or something or they've become a spreadsheet junkie, playing endless 'what if?' games on their spreadsheet. There was a survey done recently in the US on American executives and 66 per cent of them admitted to playing video games during office time, and during their lunch hour. Only 10 per cent of them preferred to go drinking at lunchtime, and only 2 per cent went for intra-office sex, which of course is a bit of a problem these days, in these open plan offices.

Safer with machines, isn't it?

One of the problems we have identified in the office is a lot of computer usage is symbolic rather than substantive; computers tend to get stuck on the desk in order to impress passers by – to make it look as though the company is 'with it' and up to date, but in fact they are being used for fairly trivial purposes.

That's why they think I'm a drongo, because I don't have one on my desk.

Yeah, but I still think you should use one, Robyn.

An empty one as a symbol. What about the home, and the 'electronic cottage'. What's the future of that do you think?

One of the most common predictions made 20 years ago was that by now we would all be living in the so-called 'electronic cottage' or the 'wired society'. This would enable more people to work, shop and bank from home and so on. Practically none of those predictions came about for some very obvious reasons, and that is that most people want to get *out* of the house in the day time. They don't want to spend their whole life between four walls working, they actually *like* going out shopping, being able to feel the goods they're buying and compare them. Home banking didn't work because you can't get cash out of a television screen. So, far from living in a cashless society, we're using more cash than ever before. The technocrats really got the electronic cottage and the home applications completely wrong, because they ignored the human factor.

Some of them lost heaps of money; for example, one company in the US lost $55 million trying to interest the public in videotex information systems. People don't *want* any more information – most people have pretty low information needs. They're inundated with information as it is.

How do you see Australia's role in an information future? Are we simply subject to whatever the Japanese and the Americans and the Western Europeans produce? Or can we take a lead in our own sort of future as well?

I'm afraid that in the past we have had our IT future dictated to us to some extent by foreign computer companies. They've kind of seen Australia as a mug market where they can get

we have been kind of hooked on this hi-tech cargo cult

rid of second rate equipment. We ourselves have been hooked on this hi-tech cargo cult, which we need to get off of, because alone amongst the major advanced nations, we hardly produce any of this stuff ourselves. So imports of hi-tech equipment make a huge hole in our balance of payments and I really think we need to wise up and get a bit smart, become more selective in our purchases, and not be ripped off by overseas computer companies.

So how do we avoid the cargo cult? We've got to get selective pretty quickly haven't we? How do we do that?

Well I think the more we learn about the fundamental lessons of the IT revolution so far, then the less likely we are to repeat the mistakes which have been made before. It also makes financial sense to have regard for these fundamental social factors that have affected the development of the IT revolution. ● **Robyn Williams' last feature for *21.C* was on Roland Fletcher's cities of the future. He is the chairman of The Australian Commission for the Future.**

Technocop

Police surveillance of tomorrow will incorporate the most advanced technologies from NASA and the US military.

On the horizon of the next century lurks a police state where armoured vehicles patrol racially segregated fortress neighbourhoods, police in tall towers survey the populace through heat-sensing, night-piercing glasses and where the nefarious currency of crime is traded through modems and microchips.

For decades, Hollywood has defined the future in terms of a crime culture under the thumb of an authoritarian regime. Science fiction, too, has given us visions of a future where violence, crime and individual survival have replaced community and democracy.

Now imagine an average suburban street in an average Australian city: modest houses nestle behind green lawns and low brick fences; picture windows face the street where children play cricket and adults exchange dya-to-day pleasantries. Could all this be about to change, and with it, the law enforcement institutions which shape and protect our society?

That is the prediction of criminologist Bruce Swanton. A senior researcher with the Australian Institute of Criminology, Swanton believes Australian police forces face a time of dramatic transformation. Already, many of the technological advances which have transformed American policing, are being or about to be deployed in Australia: massive computer data banks, articulated robots, stun guns, high security villages and drug sensing devices.

"Within the next 10 years we will see much greater utilisation of robots for non-contact control. In an increasingly risk oriented society developments once fraught with political problems will become more acceptable," Swanton says. He argues that as crime increases in complexity and violence, pressure for better law enforcement will follow. While issues such as the use of truth eliciting drugs, chemical castration and widespread public surveillance are currently taboo, the pressure to dispense with such sacred cows may prove overwhelming.

New age policing has more in common with *Bladerunner* or *Robocop* than *Copshop*. According to many criminologists and police, the technology, philosophy and strategies of future policing will be unrecognisable.

In their future visions, high speed police chases are very much a part of history. Police merely push a button which cuts dead the fleeing car's engine. Smart cars fitted with crash bags and speed inhibitors all but eliminate road accidents. Highway signs warning 'Drowsy Drivers Die' are a thing of the past as-automatic sensors safely halt moving vehicles when the driver demonstrates lack of concentration or erratic driving. Similar sensors eliminate drink driving and car theft.

Technology will have transformed more complex and dangerous police tasks. Unruly crowds will be incapacitated by laser and strobe stun guns, air rifles and nausea inducing gases. Articulated robots operated by remote control will be used to quell street violence or disarm bombs. Remote sensing robots may eventually replace police in many traditional threat scenarios such as hostage sieges and armed insurrections. Even the police officer's trusty .38 is replaced by a sonic lance which incapacitates rather than kills an offender.

But new technology is only part of the reason for the transformation of policing next century. According to Victorian Police Assistant Commissioner Gavin Brown, white

As global resources diminish, conflict between those wanting to exploit resources and those struggling to protect them will pose new challenges to police.

ILLUSTRATION ROBYN STACEY

collar crime and the information revolution promise to transform current policing methods.

Brown is surprisingly frank about police limitations in relation to computer crime: "There are some areas where we acknowledge that the technology is such that at this stage we just don't have something to combat it. There are problems caused by the use of very advanced technology by a small number of people."

The exchange of hard core pornography through computer networks and computer espionage already taxing police beyond their ability to control or even apprehend criminals. Add to this the burgeoning information revolution, including a proliferation of personal computers, cellular phones, modems and faxes, and the sheer magnitude of policing information becomes unimaginable.

Other 'growth' areas of policing include industrial espionage, genetics and the environment. "Traditional threat scenarios like terrorism are out of vogue," says Swanton. "Although it won't go away, it won't be much of a threat because there are tremendous precautions in place. One area where you can expect growth is the environment." He argues that as the economic costs of environmental destruction grow, illegal dumping of pollutants will increase. Moreover, as global resources diminish, conflict between those wanting to exploit resources and those struggling to protect them will pose new challenges to police.

Another impetus for change within Australian policing will come from the rapidly ageing society. As fraud crime against older people grows, they will increasingly form themselves into fortress communities. "An entirely new and highly specialised branch of crime and nuisance prevention aimed at geriatrics will develop in the very near future," says Swanton.

Like many other criminologists, Swanton takes an essentially pessimistic view of future Australian society. Increased pollution, environmental degradation, poverty and unemployment will in turn create more crime. The blueprint for such dystopian scenarios can be found in Los Angeles where community cohesion and respect for personal liberty has given way to a far from liberal security order.

In his recent book *City of Quartz*, Californian writer and academic Mike Davis sums up the merging of present and future in Los Angeles; "Images of carceral inner cities (*Escape from New York*, *Running Man*), hi-tech police death squads (*Bladerunner*), sentient buildings (*Die Hard*), urban Bantustans (*They Live!*), Vietnam like street wars (*Colors*), and so on, only extrapolate from actually existing trends." Davis continues: "In cities like Los Angeles, on the bad edge of postmodernity, one observes an unprecedented tendency to merge urban design, architecture and the police apparatus into a single comprehensive security effort."

Davis argues that brutalised inner suburbs, racially segregated housing, anti-democratic architecture and the militarisation of public space herald a fundamentally different relationship between police and the population.

In the face of growing racial and economic tensions, those who can afford protection seclude themselves in fortress suburbs or subscribe to a booming private surveillance.

industry. As in many other American cities, whole suburbs are being fenced and patrolled to create high security enclaves. Such security madness even extends to garbage. One restaurant recently erected a $12,000 steel cage to prevent hungry street people from stealing waste food scraps.

According to Davis, a new division of labour has arisen in which private security firms dominate labour intensive surveillance work, while public law enforcement concentrates on the supervision of security macrosystems and paramilitary responses to civil disturbances.

Los Angeles leads the United States and perhaps the world in the use of electronic surveillance, mainly as a means of replacing traditional modes of policing. Earth-bound surveillance is complemented by a bevy of airborne crime fighting and surveillance helicopters. The technological transformation of the Los Angeles Police Department (LAPD) owes much to military strategy and the technological spin-offs from the Military Industrial Complex. The city's massive computerised central command complex (Emergency Command Control Communications Systems) is based on technology developed by Hughes Aerospace and refined by NASA. It cost $42 million, took seven years to build and gives police command, control and communications abilities equivalent to most modern militaries. Not surprisingly, it is the most technologically advanced system of its kind in the world.

"We will eventually lose the fight against crime but whether we lose out to criminals or by having a totalitarian government is hard to say. I feel that historically democracy is doomed and law and order and morality are doomed."

The LAPD also possesses vast information processing capacities as well as access to data bases on 'suspect' citizens. Together, Mike Davis argues, they form "the central neural system for the vast and disparate, public and private, security operations taking place in Los Angeles".

But is the Los Angeles experience relevant to Australia, with its vastly different culture and history? Bruce Swanton argues that many of the developments which have transformed policing in American cities will be replicated in part in Australia. The evolution of high security residential enclaves and private security patrols, both as a response to rising property crime and violence, has already begun, he argues: "With an ageing population protection for these people will be a major criminal control challenge. But communities will not necessarily be barricaded. They may feature controlled access as in New York where poorer communities have banded together to hire private security. It will be a feature of ordinary communities not just wealthy communities."

In 1991, the wealthy inner Melbourne suburb of Doncaster-Templestowe proposed introducing private security patrols in the wake of the abduction and murder of schoolgirl Karmein Chan. While the idea was eventually shelved because of the cost, it enjoyed considerable public and government support. A year later, the council again challenged the traditional relationship between police and local government when it helped develop and trial a computer based, crime information analysis system.

Many analysts believe such joint ventures will become more common as financially strapped police forces seek to rationalise their operations and expenses. Assistant Commissioner Brown believes there are too many differences between the American and Australian police experience to support a worst case scenario developing in Australia: "We will have some of the outward symbols of America – the weapons for example and the communications technology. But in terms of the management of forces it will be a different sort of thing. We are by US standards a very unique police arrangement. In America there are over 40,000 law enforcement institutions which vary from a few members to the New York Police Department which has 40,000 members. We have greater accountability and it is not a politicised force."

One of those symbols – advanced computer data bases – has already arrived and promises to transform many aspects of police activity. This month, the Victorian police launched the Law Enforcement and Assistance Program (LEAP), a centralised crime information collation, analysis and communication system, which will give all police instant access to a vast array of crime related information.

At the heart of all future crime scenarios are the criminals. How society deals with the criminal under-class may in turn shape future crime trends. The American case, again, provides many lessons. In Los Angeles, even liberal politicians concede reforming criminals is virtually impossible. Bruce Swanton believes the same is true of Australian criminals: "We are going down the American track. The answer is we can't change criminals. How do you change a person who will steal from or rape old ladies? Most criminologists now concede that the number of people who truly reform is very small."

His answer, like that of most US politicians, is to lock criminals away for a long, long time. The result, however, is a highly segregated society characterised by a vast, poorly educated criminal under-class. Ultimately, such developments threaten the very fabric of democracy. Even if the police 'win' the fight against crime, it will be a pyrrhic victory.

"We will eventually lose the fight against crime but whether we lose out to criminals or by having a totalitarian government is hard to say. I feel that historically democracy is doomed and law and order and morality are doomed."

Welcome to the Brave New World. ●

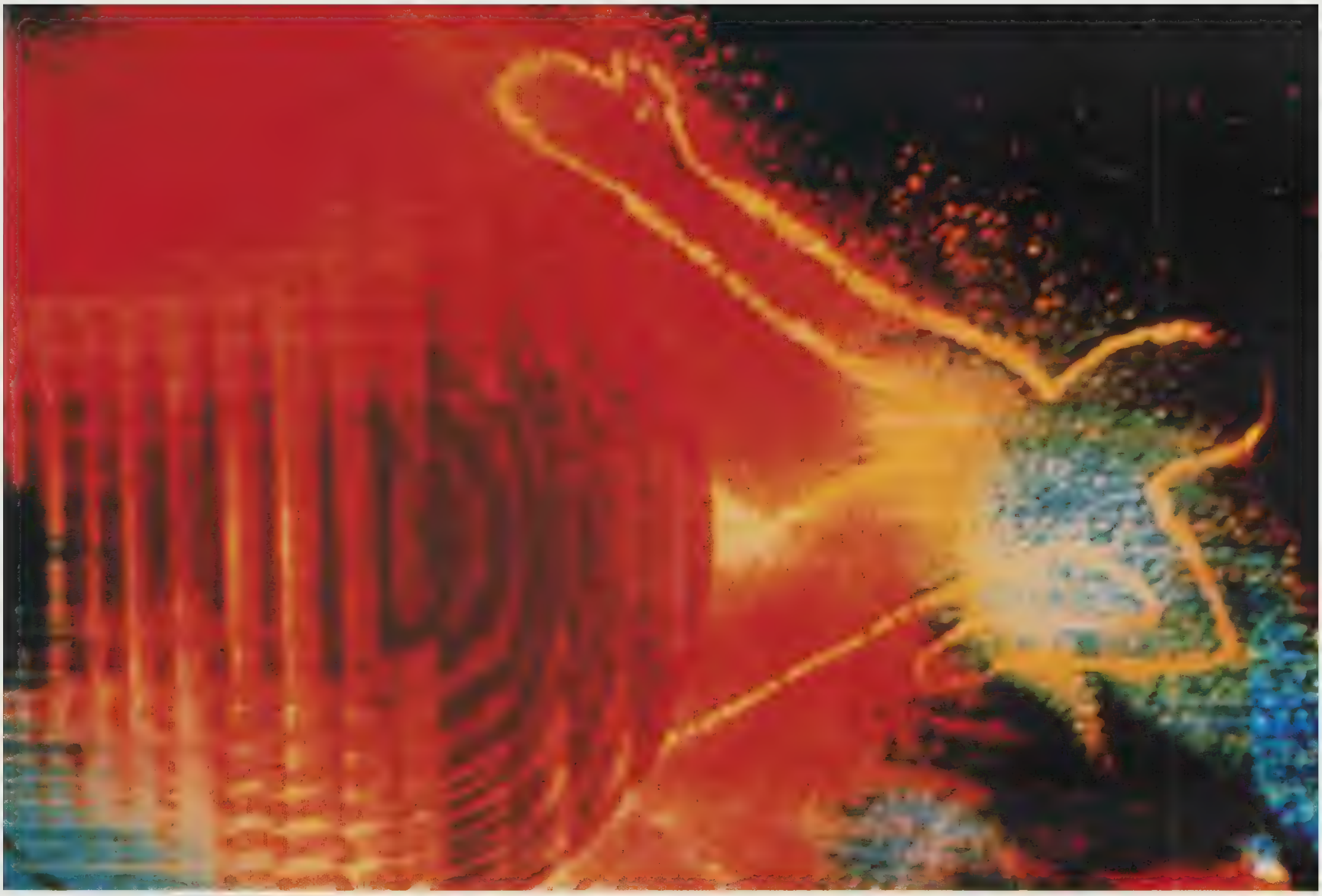


ILLUSTRATION: ROBYN STACEY

Drawing the line: the case for civil liberties

AN INTERVIEW WITH ALAN GOLDBERG, PRESIDENT OF THE VICTORIAN COUNCIL FOR CIVIL LIBERTIES

For the past decade, the Victorian Council for Civil Liberties has led the debate over police powers. VCCL president Mr Alan Goldberg is a champion of civil rights, privacy and police accountability. While his views arouse considerable controversy, even hostility, he remains an unrepentant freedom fighter. As Jo Painter discoves, Goldberg expects technological and social changes to keep the council busy for decades to come.

Do you think civil liberties issues will become more pertinent as the role and nature of policing changes?

Yes, not just as the role of policing changes, but as the role of government changes. We are becoming or have become a very regulated society. It's not just police, there are many people with powers of investigation now. If you take an overview you see that we are very regulated in all areas.

Some people would argue that the more we are regulated, the less we worry about regulation.

Yes, but that is insidious. That means because people's liberties are restricted they should accept it. Look at the reaction you had from the people in Eastern Europe in the past two or three years. When you talk to people who have lived in an oppressed society, they will tell you you can't compare the freedom and human dignity when you are not subject to surveillance. That is what happens when the recognition of rights and civil liberties is suppressed.

Where your rights and liberties are not in question, you don't worry about them. You live in a secure society. It is only when your rights and liberties are under threat that you realise how important they are to you. The way to ensure they are not under threat is to raise consciousness and awareness of our rights.

How do we as a society draw the line between what is an acceptable level of police surveillance and power, and those actions which are not acceptable?

You have a right to privacy, you have a right to freedom from surveillance. At the same time you have an obligation not to break the law. You should not be the subject of police surveillance unless the police have reasonable grounds to suspect you are involved in something.

Is the case for greater police powers overstated? For instance earlier this year the police installed security cameras at the MCG because of perceived public security problems. Is the risk of crime exaggerated to justify more police powers?

There was a pilot study at the MCG [which] asked people what they are most worried about. The three things that concerned them most about going to the cricket were, the price of tickets, the price of food and parking problems. Relatively few listed public security as an issue. The police were reacting because there was a very small section of people with perhaps a loud or high profile causing trouble. The implication of a small group of people causing trouble is that the MCG exposes everyone to surveillance. It shouldn't be the answer because it exposes you and I in a public place to be recorded.

The Commonwealth Heads of Government Meeting (CHOGM) cameras, installed along major Melbourne city streets for surveil-

lance in the mid-'80s, were described as the 'thin edge of the wedge' in the introduction of public surveillance technology. Do you share this concern and what issues do you think such technology raises?

It is very much a concern because the police are indulging in wholesale surveillance of the community quite independently of any suggestion the people being surveyed might be involved in the commission of offences. The right to privacy is very valuable and it ought to be cherished and not intruded upon unless there are real issues in relation to crime.

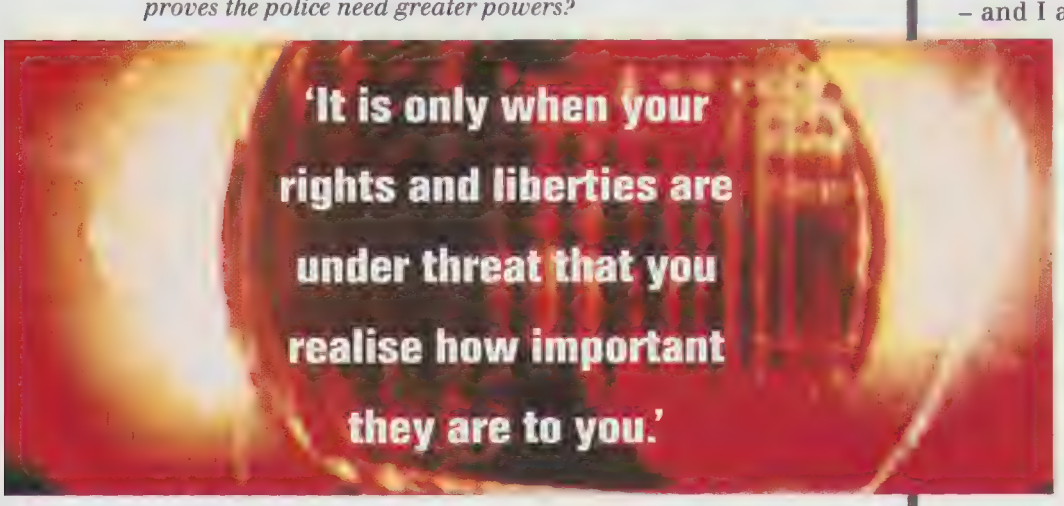
Policing information, particularly data banks, is a major challenge for police. Do you believe the police are equal to the challenge and is there room for abuse?

If you have data banks, you have to have a secure system of control, accountability and responsibility. If you are going to develop sophisticated technology you can't allow the technology to take over our rights and liberties. The answer is you have to devise systems which ensure you can't break into them.

What is so wrong with a recent proposal to give police the right to stop people in the street and obtain their name and address.

To have the right to ask you for your name and address for no reason creates the opportunity to build up data and a profile on a person, unrelated to the need for crime prevention. It is a general power. You have to have a condition for the operation of a power. You have a freedom from aggression, from imposition by authority, and a freedom to have your own privacy protected.

It could be argued that the recent refusal of a magistrate to allow police to take DNA samples from a suspected rapist and murder proves the police need greater powers?



Why? The police are obliged to demonstrate why they needed to take a DNA sample from this chap. That is the protection. Do you think any authority should have unfettered power over us?

Where do we draw the line? Certainly most people would accept that a suspected child rapist and murderer should be compelled to give DNA and fingerprint samples if this will assist in his apprehension?

The divide is those laws that intrude unnecessarily into your freedoms. For example most crimes are committed at night – therefore we should have a curfew in Melbourne. Would you regard that as acceptable? It is an unnecessary restriction on freedom and it is a step totally out of proportion and unrelated to a need to solve crime. I don't think it necessarily follows that such information makes crime prevention easier. The consequence of that is to intrude into everybody's freedom in relation to a matter that may or may not be of advantage to them. Everyone becomes a suspect. ●

The Piracy of Privacy

BY SIMON DAVIES: Today is January 20th, 1993, the day of the inauguration of the 42nd President of the United States of America, and I am writing these words on a lap top computer at a table in the far corner of a pub on Pennsylvania Avenue. When I have completed my work, these words will be transmitted instantaneously to Australia, from where they will be broadcast around the world in printed form.

An impressive chain of events indeed, and one which mirrors a theme of the President's inaugural address delivered across the road less than an hour ago. He took an optimistic view of the potential information and communications technology, urging his country to embrace the opportunities they offered.

I am an avid user of information technology, and, like the president, am constantly amazed by the great things it allows me to accomplish. I am, however, a little less enthusiastic about its value for the majority of non-users – and I am certainly less optimistic than President Bill Clinton about its capacity to reshape our world for the better. While it's true that through the use of technology we can do such things as communicating from a pub in Washington DC through pages of a magazine almost faster than sending a letter, I fear that this positive aspect of technology will ultimately be outweighed by far more sinister uses.

I believe that the development of information technology is in the hands of the elite which embraced former technologies. I suspect that information technology is not going to become the silver lining for the future; instead, I believe there is a growing body of evidence to show that it will be largely an instrument to create new and more frightening forms of discrimination and surveillance. If this is the case, the future for our privacy is bleak. It is made even more bleak by the popular view in the Australian community that citizens must reveal all to prove that thay have "nothing to hide". Information technology is the tool being used to expose the individual to full scrutiny.

It is simply not chic to discuss the downside of technology amongst those who *understand* the technology. I have tried, and (usually) have failed. The technological elite are positive by nature. They are directed. They have goals and visions. They are structured and focused. If you speak about the manipulation of technology by vested interests, most will chant the mantra of progress and

tritely respond that the good will outweigh the bad.

Sadly, this is not true. Information technology is, predominantly, in the hands of a single minded elite directed by greedy business people who run powerful profit centred organisations. The dream that technology in the hands of these organisations will provide a new era of knowledge, freedom and personal control for the masses is not likely to eventuate. The development and marketing of information technology is manipulated, in most instances, not to benefit the majority, but to blatantly penalise those who do not embrace it. Take the proposed introduction of Calling Number Display, or "Caller ID" by Telecom. This device, attached to your telephone, will let you know the telephone number of an incoming call even before you pick up the receiver. It is intended, the telephone companies tell us, to give greater control to the telephone user.

'I believe there is a growing body of evidence to show that [information technology] will be largely an instrument to create new and more frightening forms of discrimination and surveillance.'

Instead, the North American experience is demonstrating that the mechanism is being used by commercial interests to hijack the telephone system and monitor the calls of individuals. People calling a company or government agency unwittingly provide their telephone number, which is then used in the compiling of direct marketing lists – as well as for more harmful purposes. Anonymity, if it can be achieved at all, must then come at a price, as callers pay to block the sending of their number when they make calls. Those who do not send their number as part of the call are sometimes regarded with suspicion by called parties, and are either ignored or treated as second class customers.

Technology has the potential to protect privacy, but it is rarely used for that purpose. Data matching, in which computer files are automatically mass matched against each other (a form of computer linking) could be used to detect those who are entitled to receive government benefits, but who do not avail themselves to this right. Instead, data matching is used as a tool of mass surveillance to detect abnormalities in payment and income details. Electronic communications by way of our computer networks can use encryption technology to protect the privacy of our communications. However, law enforcement agencies such as the FBI are moving rapidly to bring an end to such protection. They want the right to unlock the encryption of computer communications. Smart card technology has the potential to give strong and enduring protection to sensitive personal information by having this information stored on the card, rather than in centralised systems. But time and time again it has been shown that organisations marketing smart card systems abuse the smart card concept by misleading the public about its real potential (usually the smart card ends up being merely a copy of the data held in central or distributed data repositories, creating the mirage of privacy protection, and thus making our personal privacy even more vulnerable).

The greatest abusers of information technology, however, are governments. The Australian government is a world leader in the development of surveillance technology, and this trend is unlikely to change in the immediate future. Instead of recognising the sensitivity of personal information, and the natural right of privacy in a free society, Australian governments have moved to establish surveillance technologies that embrace extraordinary dangers to privacy. Data matching amongst commonwealth departments, has become routine, making a mockery of so-called privacy protection in law. In his fourth annual report, issued recently, the Federal Privacy Commissioner has clearly conceded that privacy law is now being used as the basis for privacy invasion.

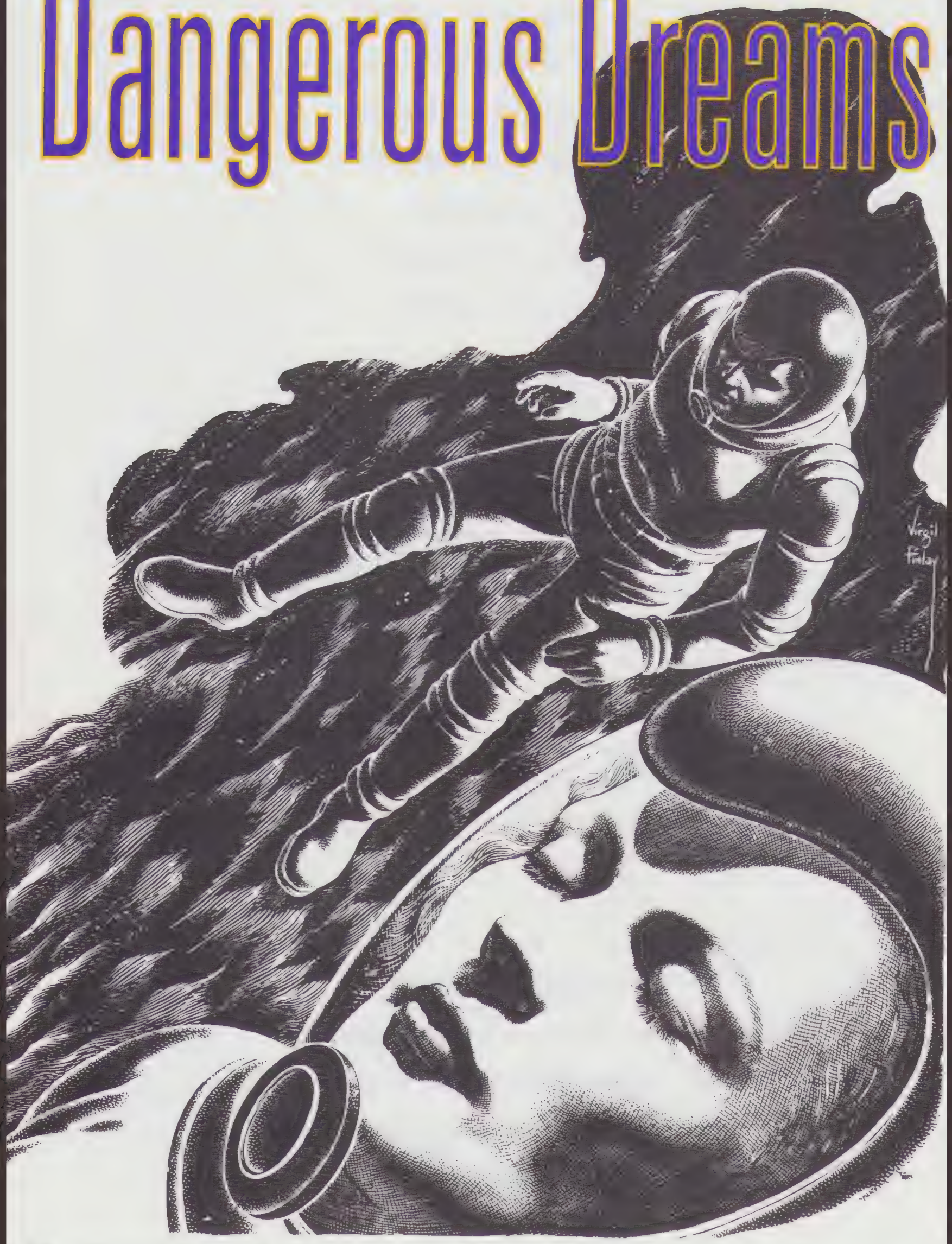
Simon Davies is a journalist and author of 'Big Brother: Australia's growing web of surveillance', which used this photo of Davies on its cover.

The collection of personal data by law enforcement agencies such as the Australian Federal Police is greater than in virtually any country on Earth. Corruption amongst the users of information, as evidenced by the recent report of the Independent Commission Against Corruption, has become endemic. Personal information provided by people under compulsion is brought together on publicly available registers, and massaged by technological means to meet unintended purposes (for example, electoral roll or telephone number information can be reverse indexed so that your details can be cross matched, analysed and cross referenced in novel ways).

Information technology may in theory provide great advantages to personal privacy in some instances, but I see almost no advantage in practice for the protection of our privacy and rights. Whenever in the past technology has been used for that purpose it has been neutralised or hijacked by vested interests. I am afraid that, based on current trends, we are destined to live in a society with precious little privacy. ●

'The Australian government is a world leader in the development of surveillance technology, and this trend is unlikely to change in the immediate future'.

Dangerous Dreams



SCIENCE FICTION, it's often said, is the mythology of the 20th century – and, very soon, of the 21st. SF shares a crucial, and rarely discussed, feature with myths and dreams – each has a specialised language, with its own peculiar syntax (which goes far beyond inventive terminology). The only way to learn SF properly is by reading loads of the stuff, preferably at a tender age.

Just as a solitary dream cannot be decoded even by the fanciest analyst, just as mythic tales must be fitted together like an enigmatic jigsaw-puzzle portrait of a culture's unconscious, so too SF depends on its unorthodox and occasionally baffling vocabulary and grammar; its 'intertextuality', the way it builds worlds by reference to what's been done in previous SF. Without that cross-referencing, science fiction can be next to meaningless. Once acquired, though, it becomes an expression of excitement and astonishment: states and emotions repressed in a work-a-day world. What's more, these sentiments are linked in SF to the century's motor: knowledge sought and gained by science.

The coupling with science is not direct. Just as dreams can express wishes and fears we would rather disown, science fiction is often an outlet for what might be called 'black science'. Dreams of omnipotence through abstract knowledge, hunger for gods out of the machine. These are dangerous desires, leading all too easily to goose-stepping and napalm nightmares: all the monsters bred of the dreams of reason. They are, in short, a regression to the pleasures of infancy, the endlessly-accepted temptation to which commercial SF all too often delivers itself.

To capture the flavour of the infantilisation of much mass-market science fiction (and there is rarely any other kind), it's sufficient to cite a random selection of American publishers' trade magazine announcements:

• THE LILLIPUT LEGION by Simon Hawke – The time commandos journey to *Gulliver's Travels*.

• REVENGE OF THE VALKYRIE by Thorarinn Gunnarsson – Here is the blazing epic sequel to *Song of the Dwarves*.

• GUARDIANS OF THE THREE VOL. II: KEEPER OF THE CITY by Bill Fawcett – This is a magnificent epic of adventure, romance, and wizardry set in the unique world of the catlike mrem.

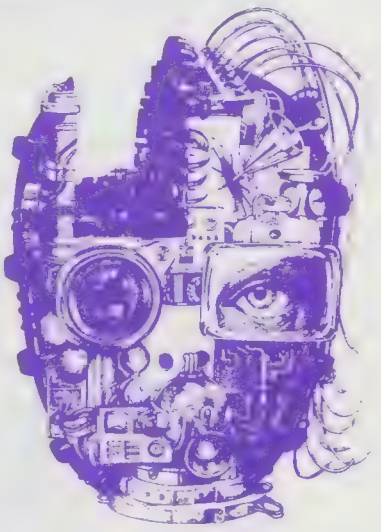
• BROTHER OF DEMONS, BROTHER TO GODS by Jack Williamson – From the test tubes of a dying humanity comes the first of a race of gods.

• LIMBO SYSTEM by Rick Cook – Demonic aliens had been trapped in a single planetless system for a million years. Now the Earthmen have uncorked the bottle.

This prose captures the market realities of today's SF with some precision: pseudonymous authors, excruciating bathos – *blazing sequel to dwarves!*?

For habituated readers one of the dubious comforts of this list is that the cat-like mrem live in a world which is precisely *not* unique. Reading page after page of these advertisements, it's easy to see why the Earthmen uncorked the bottle. I certainly did! Of course, while contempt comes easily, it might not be entirely appropriate. Sight unseen, Professor Williamson's book might conceivably prove to be a masterpiece homogenised by a publicist's reflex and the demands of commerce.

By and large, however, the blurbs reflect the reality of the texts. As Australian critic John Foyster has said of this publishing trend, which seems to reverse the minor current of challenging adult work (from Cordwainer Smith's politically dubious fables to Ursula Le Guin's interrogations of gender and politics): "Bluntly put, the question is 'is there, or should there be, science fiction after 19?".



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His negative answer strikes me as unnecessarily conservative. Foyster then offers, as a rebuke to this increasingly juvenile tendency, a lament by the poet Philip Larkin, two decades ago, at the failure of publishers to show interest in Barbara Pym's writing. Perhaps no writer could have been further from science fiction, of course, which is Foyster's point. Because Pym's subject matter was the most ordinary of upper or middle class English lives, all chronicled in the most barbed and refined style.

Larkin wrote in her praise: "I like to read about people who have done nothing spectacular, who aren't beautiful or lucky, who try to behave well in the limited field of activity they command, but who can see, in the autumnal moments of vision, that the so-called 'big' experiences of life are going to miss them...".

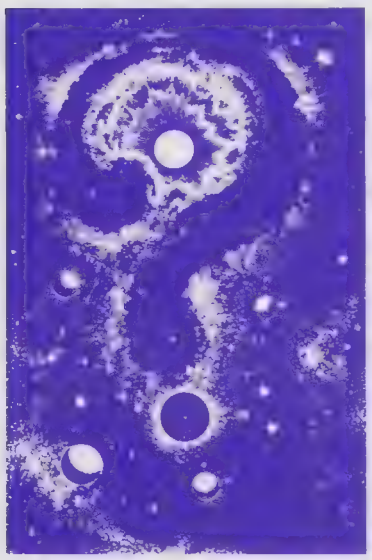
It's true that SF's best hopes *are* almost lost in the immature trappings of a genre funded by bored or harried readers searching for opiates and dreams of some ultimate 'scientific' quick fix for an irredeemably disappointing reality.

Maybe Larkin preferred to read about people who have done nothing spectacular. But in the social world of the 20th century – especially at the close of a millennium where science works invisibly, brought to awareness for most in

abrupt shocks like human *in vitro* fertilisation – even those living modestly, and eschewing the spectacular, are participants. It is perfectly possible, therefore, that the metaphors of science fiction are the perfect mode of capture for such an epoch.

Unlike most forms of literature, SF's inventions are simultaneously naturalistic yet radically distanced from any 'reality' outside its own – ironically even from the world-shaping realities of science and technology. SF estranges us from the familiar, but not by the alienating effects hailed by such 'mainstream' critics as Bertolt Brecht or Roland Barthes.

SF may enter into the truly alien; at its best, it is probably obliged to do so – for example, Samuel R. Delany's novel *Stars in My Pockets Like Grains of Sand* changes the very ways in which its characters think (and act) about sexuality. Most of the characters freely adopt hetero- or homosexual forms of sexuality, or even develop meaningful relationships with large horny-toed (but deeply sensitive) alien reptiles. Amidst this sexual free-for-all, everyone routinely refers to everyone else as 'she' – unless the individual wishes to express desire for another, in which case 'she' will refer to 'her' as 'him'. Confusing? For the 20th century reader, yes – for a while. But the textual innovation cuts through our smug certainties far more vividly than any libertarian lecture could.



The best that SF can hope to provide us in the way of 'prophecy'. . . is a scatter of possible futures or alternative life-worlds. But many narrative components of those alternatives accepted as part of the common grammar and lexicon of SF writers turn out to be plainly impossible in the real world — not just empirically but logically: travelling backwards in time or faster than light, psychic powers allowing heroes to read or control minds, teleporting across the void by sheer will power.

Sex is certainly not the only aspect of our experience that SF can estrange. Consider how we read a passage from a realistic novel such as Robert Stone's *Outerbridge Reach*, compared with David Zindell's recent science fiction, *Neverness*. Without a moment's thought, we call on an astonishing amount of detailed knowledge of the known world to understand Stone's scene:

"When the last week of February came in mild and spring-scented as April, Browne decided to deliver a boat to Annapolis. He passed under the Verrazano Bridge shortly after dawn on the last Wednesday in February. With Sandy Hook ahead, he cut his auxiliary and hoisted the mainsail and genoa."

For an Australian, the first remark sounds crazy, for a moment, since April is early autumn. But hang on, it's reversed in the Northern Hemisphere. Then we pick up on the place names, which confirm that this is happening in America. The specialised nautical terms (alien to one who hasn't a clue what a 'genoa' is) convey authority as well as fact. Above all, the text situates itself within the actual world. Contrast this with Zindell's *Neverness*:

"My ship did not fall out into the center of the moons. Instead, I segued into a jungle-like decision tree. Each individual ideoplast was lovely and unique. The representation of the fixed point theorem, for instance, was like a coiled ruby necklace. As I built my proof, the coil joined with feathery, diamond fibres of the first Lavi mapping lemma."

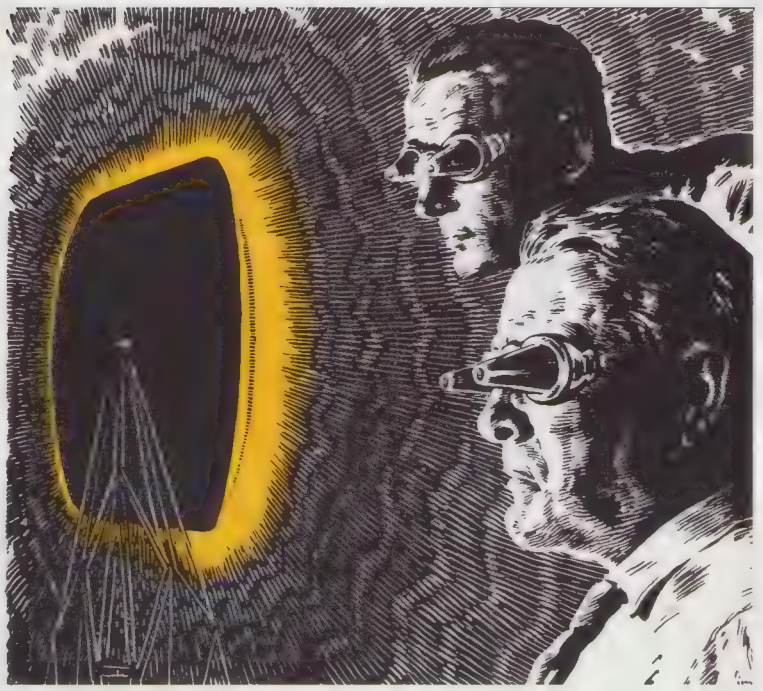
These star pilots, the SF-trained reader realises slowly, are taking their ships through windows in hyperspace by proving mathematical theorems! Yet, strange as it sounds, today's pilots do something like that already. Mapping a course, by hand or by computer, is the application of mathematics to the shape of the world. These futuristic pilots just happen to be doing it (somehow) directly! Feeling these sentences work, getting the point, is an audacious and shivery pleasure for those who know that the trick to decoding such sentences is not by way of the conventional dictionary and encyclopedia.

Yet SF's amusing (or shocking) distortions and defamiliarisations of the present consensual world are all too easily random, catch-penny. As SF writer and critic Kim Stanley Robinson notes: "when this is done regularly, as it was during the 1930s, then the distortions are meaningless individually, and cumulatively they tend to reinforce the assumptions and values of the dominant culture of our time, for assumptions and values survive this sort of distortion and are presented as existing unchanged, thousands of years into the future".

Unsympathetic commentators have regularly advanced this general point with a killing flourish, evidently in the belief that SF insiders have never considered it. But they are wrong. A recent bad tempered outburst by Brian Aldiss is poignant:

"The love of art and science I developed as a child was a

SF is not theoretically or practically subversive in any obvious way. It is hardly even innovative (well Heinlein did invent the waterbed). If anything, SF tends to borrow from the speculations of contemporary scientists; indeed, today these speculations often reach the public more swiftly via readable, pop-science by articulate scientific practitioners such as Professor Paul Davies.



rebellion against the smug bourgeois society in which I found myself. Art and science were what 'They' hated most. The awful victories of *The Lord of the Rings*, *Star Trek*, and *Star Wars* have brought – well, not actually respectability, but Instant Whip formulas to SF. In the old days... SF was an act of defiance, a literature of subversion, not whimsy."

But should SF be subversive? And if so, subversive of what? Of political certitudes, or our easy acceptance of current scientific and artistic paradigms? The question seems perverse. After all, isn't science fiction automatically the text of change, of unnerving prediction?

Yet its 'prophetic' writers never tire of reminding us that SF is not prediction. In an article titled 'The Predictions of Science Fiction', the late Isaac Asimov confessed: "Actually, there is very little in the vast output of science fiction, year after year, which comes true, or which is ever likely to come true". Listing some of his own most celebrated tropes, he added, "I don't consider that any of these have predictive value; they weren't intended for that. I was just trying to write entertaining stories about the might-be, not at all necessarily about the would-be."

Indeed, how could SF be authentically predictive? On the effective case argued by the philosopher Karl Popper, the main reason for the future's cloudiness is the absolute unpredictability of scientific research itself. Who can tell what will emerge from the lab next?

The use of moderate temperature superconductors is one such example. In fictional form they've long been the basis of 'hard-SF' from specialists such as Larry Niven. Normal temperature superconductors play a pivotal plot role in Niven's *Known Worlds* series, especially the two books set on the celebrated Ringworld. For decades it seemed they were pure fantasy; physics denied their existence. Abruptly physics as well as technology has undergone an expansion, and we live in a slightly altered world of unknowable (though not unimaginable) consequences.

The illustrations on pages 82, 84, 85 are by Virgil Finlay, probably the most successful and influential artist to be employed by the early SF magazines, from which these images are drawn.

The best that SF can hope to provide us in the way of 'prophecy', if this line of thought is persuasive, is a scatter of possible futures or alternative life-worlds. But there's another gigantic boggle. Many narrative components of those alternatives, accepted as part of the common grammar and lexicon of SF writers, turn out to be plainly impossible in the real world – not just empirically but logically: travelling backwards in time or faster than light; psychic powers allowing heroes to read or control minds; teleporting across the void by sheer will-power.

Some of these notions might yet prove to be more substantial than the current status quo permits, but right now they seem pure fantasy to most working scientists – hardly deserving a place in 'science' fiction.

Leaving aside these counterfactual devices, SF is not theoretically or practically subversive in any obvious way. It is hardly even innovative (well, Heinlein did invent the waterbed). If anything, SF tends to borrow from the speculations of contemporary scientists; indeed, today these speculations often reach the public more swiftly via readable, pop-science by articulate, scientific practitioners such as Professor Paul Davies.

Yet significantly, conservative images of tomorrow tend to be valid only in the short-term; in the longer term, they run afoul of constant new discoveries about the universe, human ingenuity and political inventiveness. This is especially true when the 'sciences' invoked are those of the humane disciplines: psychology, economics, politics.

It's precisely here that the greatest aperture is available for science fiction to subvert established values – which is to say, values legitimated by power and 'common sense', operating to the benefit of sectional interests to the detriment of the rest of us, and the planet we seem on the verge of wrecking. ●

Damien Broderick is a regular contributor to *The Australian* on matters relating to science and fiction. His latest book is *The Lotto Effect*.

Reshaping Design

Sitting on my desk are two ball-point pens. One seems unremarkable, just another milky-white, disposable, plastic pen. The second is more curious. It's a small rolled tube of brown cardboard which pulls apart into a body and a lid; only the protruding plastic and brass of the writing tip gives its nature away. It looks like something you might expect to find in a kit of stylish recycled-paper envelopes and stationery. But it is planned for more ubiquitous usage, to meet the purchasing requirements of many government bodies and companies in Europe; requirements which are increasingly based on environmental criteria.

This cardboard pen is (supposedly) recyclable; the black plastic parts of the pen are from already-recycled material (from a shampoo bottle, or a disposable razor, or possibly even another pen). It is a small example of a new trend to design products that can be disassembled and recycled. Pull it apart and the body and lid can be dropped into the paper recycling bin.

The white pen is a manufacturers demonstration, a prototype. Produced for a European plastics convention, it illustrates another approach to the production of an environmentally acceptable product. The silky feel and the flexibility of the plastic suggests this no ordinary stationer's item; so does the embossed 'green' and 'biodegradle' stamp on the barrel. It is made from a plastic derived entirely from corn, manufactured in Italy under the trade name *Mater-Bi*. If you're prone to chewing the end of your pen, you'd find this one quite edible, perhaps even nutritious. *Mater-Bi* dissolves in water and the manufacturer's claim that it leaves only harmless biodegradable organic compounds. With this pen around the office you may need to add a compost bin next to those paper, glass, aluminium and plastic collection bins. After removing the cartridge this pen can go back to fertilise the crops from whence it came.

If you're prone to chewing the end of your pen, you'll find this one quite edible, perhaps even nutritious.

These are just two examples of the transformation taking place in almost all areas of product design; a tantalising glimpse of a sustainable future comprised of objects which will be familiar, yet radically different, having evolved, like species, to adapt to new environmental conditions. That evolution is clearly observable on the shelves of the local supermaket. In some parts of the world – Germany, for example – that change is so advanced that visiting a supermarket is like witnessing Darwin's Galapagas island where familiar species have evolved under different conditions into stunningly different forms.

Consumer products, small disposable items, cleaning agents, domestic appliances, white goods, TVs, computers and cars, clothes and packaging, are all being redesigned to reduce their environmental impact. There is some superficial greening, just the latest ploy from the advertising and marketing division. Many of the more reputable green products, however, represent very large investments in research and design, and in new materials and technology.

AS THE CONSUMER MARKET MOVES TOWARDS GREEN PRODUCTS AND SUSTAINABLE PRODUCTION, CHRIS RYAN REPORTS ON THE EVOLUTION TOWARDS ECODESIGN.

These developments are so potentially significant in the light of global environmental problems that government research and development programmes in many countries now have new categories of 'eco-design', 'design for the environment' and 'life-cycle analysis'. In December 1992, *Scientific American* included 'environmental design' in its list of the 12 critical new challenges for research in the coming years (along with 'superconductivity', 'cell regulation', 'AIDS resistance' and 'earthquake prediction'):

"Design for the environment seeks to stir engineers to think about the environmental implications of a product and of its manufacture during the earliest phases of design. These considerations may embrace a sweeping collection of issues: the environmental distress caused by obtaining the raw materials, the toxicity of using and discarding chemical during production, the likelihood that the product itself can be refurbished, reused or recycled once the consumer has decided to abandon it."

RESPONSE TO CRISIS AND MARKET CHANGE

The eco-revolution has occurred world-wide, reflecting social aware-

ness and forcing the growth of new and tougher regulations on manufacturing. According to John S. Hoffman, director of the US EPA's Global Change Division: "For the appliance manufacturer, the growing environmental movement means change and opportunity. Companies that redesign their product lines and offer green products will keep the planet green and will also put more 'green' into their shareholders' pockets."

Despite these new developments, the sobering question must be asked whether the rate at which the environment is deteriorating is faster than our response to those changing conditions? Can the design of new natural fabrics, recyclable BMWs, low-energy transport systems, recycled plastic containers, moulded papier mâché containers, green fridges, solar houses, mercury-free batteries, string shopping-bags, compact fluorescent lamps, solar rechargeable torches, imitation styrene filling made from pop-corn, returnable and recyclable Nordika ski-boots... save the world and stave off the impending environmental collapse?

A more optimistic way to look at it is in the relationship between production and consumption and the generation of desire. If you just consider the current green products, which have limited reach and often reflect only small, incremental, changes in environmental impact, it would be reasonable to feel some pessimism about the possibility for achieving a sustainable future.

Indeed some of these green products only resolve problems at the expense of others. A recent European report on the environmental costs of liquid food containers warned that "no single container leads the field in all respects... action taken to solve one problem... often exacerbate the effects of another".

Another example is the focus on electric vehicles as sustainable transport. They may only substitute one form of fossil fuel for another and shift emissions from one place to another (depending on the way electricity is generated and the efficiency of electric vehicles). Their image as 'clean' may just mean increased consumption.

Even the use of biodegradable plastic is problematic. Disposable articles made from *Mater Bi* might prevent the gutters and the tips from filling up with discarded plastic objects; but if we decide that we want to produce, for example, disposable razors, then we need to consider whether it is better to make those razors of a plastic which gets recycled back into razors or from agricultural plastics which can only be recycled into compost. As far as I'm aware, no-one has considered this question in detail. It involves – among other things – assessing the relative energy consumption of the two options, and difficult comparisons between the impact of extracting oil for plastic and using land to grow corn. Answers to such questions will depend on what recycling systems exist and the ability to clearly (and quickly) distinguish between, for example, *Mater-Bi* and PET. If biodegradable plastic razors compete for the green consumer against PET ones, then established PET collection systems could quickly become 'contaminated' with (incorrectly disposed of) *Mater-Bi*, breaking down the whole system. Again, we need to consider whether recycled cardboard pens and biodegradable plastic pens will just increase the tendency of consumers to 'use and discard' without concern.

ILLUSTRATION TODD DAVIDSON

GROUNDS FOR OPTIMISM

The change to green manufacturing is as significant as any previous industrial revolution, creating the potential to achieve what the Italian author Ezio Manzini has labelled "the shift from the 'society of growth' to the 'society of sustainable development'". This optimistic view stems not from some naive faith in technology but from recognising that "successful design is like alchemy" as Adrian Forty described in *Objects of Desire: Design and Society since 1750*. "[Successful design] fuses together disparate ideas from different origins," Forty says, "so that the form of the completed product seems to embody only a single idea, which comes across as so familiar that we find ourselves supposing it to be exactly what we ourselves had always thought".

In the change in the nature of manufacturing over the last few decades, design and new materials have underpinned a shift towards a so-called 'mature industrial society', one in which, to use Manzini's description, "the cultural component plays an increasingly important part". Manzini believes a society has emerged "in which producing and consuming are increasingly, and ever more avowedly, cultural actions; a society in which products are offered and consumed more for what they *mean* than for what they *are*" (emphasis added).

Manzini believes a society has emerged in which... products are offered and consumed more for what they mean than for what they are.

Manzini is concerned with understanding the nature of the change underpinning the transition from an 'era of quantity' (in which function and cost dominated) to the new 'era of quality' (in which cultural or

symbolic values, or information content, dominates). The design and manufacturing process has reached the point in which these symbolic factors (form, colour, texture, tactility, size, even smell) are almost freed from the constraints of the physical, material and functional aspects of a product. This *plasticity* of form has given us a world in which anything – any product, any material – can take on a wide range of cultural associations. Plastics (as the name denotes) have easily taken on the cultural qualities of a disposable, low value, material. The result is a world awash with non-biodegradable waste and banal, competing images and messages (which Manzini concludes has created a form of "semiotic pollution", or "cultural noise", the cultural analogue of the physical pollution arising from mass-production). The *physical* environmental crisis is intimately linked to a *cultural* crisis of our relationships with the environment.

Even though all those objects of desire may compete for our attention, they have (until this recent need to confront environmental limits), *en masse* linked the nature of desire to environmental waste and reckless use of resources. In other words, rising above the 'semiotic noise' of competing products there has been one dominant message:

"Every artefact, every technical advance produced to support our current pattern of life, carries with it some significant, long-term, deleterious environmental impact," says Manzini. "Such impact is simply the price that must be paid if human existence is to be more complex, more satisfying, more culturally and physically rewarding, than mere brute survival."

Our everyday experience of the world of created objects has tended to reflect our current projections of 'nature'. Deep-seated notions of 'nature as enemy', of 'nature as a boundless waste dump', of life based on the 'domination of nature', are reproduced and reinforced through our experience of the constructed world and as consumers of polluting, energy consuming, 'use and discard' objects. If, in the act of fashioning the material world to our ends, species are made extinct, life is eliminated from some habitats on the Earth and ultraviolet radiation at the Earth's surface is dramatically increased, then so be it. We know from our experience of our artificial world that these are just the inevitable casualties in the battle to force nature to our ends.

Under such circumstances, passivity in the face of environmental destruction, acceptance rather than action, becomes, almost, a rational response.

But, a range of 'new' products or technologies, designed to reduce life-cycle impact without sacrificing function, opens up all that has gone before to a new level of scrutiny. Patterns of change across product boundaries easily follow: if this can be produced in a recycled container why can't that; if this is a substitute for rainforest timber in this area, why won't it work in that area; if solar energy can power this torch then why can't it replace the need for disposable batteries in other areas?

The mere existence of alternatives suggests the prospect of other alternatives and where alternatives exist, passivity becomes an impossible strategy.

What is being (re)shaped in this new greener relationship between production and consumption is the nature of desire and, with that, the whole way that we envisage our relationships with nature. This is the reason I can look at the two pens on my desk and see some cause for optimism.

The interplay between product supply and demand encompasses the arena of social concern and cultural values and aspirations – the changing perceptions of what is, and is not, possible – perceptions of alternative worlds and alternative futures. This explains the current predominance of new products (and packaging) designed to keep materials (such as plastic) from the waste-stream – from tips and land-fills. Compared to say, energy use (CO_2 emissions), or CFC production, landfill volume maybe an arguably less dramatic environmental problem.

Yet nothing so clearly expresses the underlying problem of our relationship to the biosphere as the 'use and discard' approach to so many manufactured products. Nothing is perhaps quite so immediate as an experience in the act of consumption. Nothing exposes the contradictory nature of desire and identity so personally *as the purchase of an artefact which the act of ownership transforms immediately into waste*. Coupled with greener products is the greening of desire, like a cathartic change, a release from the contradictory and environmentally destructive aspects of fulfilment which is all that is available to consumers in a system of mass production based on the logic of growth and waste without limits. This is the optimistic potential of green-*design* which makes it much more than green-*technology*, its ability to direct and heighten cultural change, to act as a catalyst for a cultural transformation in our relationship to the environment. This is the new and exciting challenge for designers. Only they have the technological *and* cultural ("form-giving") skills necessary to bring about this urgent reshaping of desire; to ensure, for example, that new green products are not imbued with an image of hardship or deprivation but expressive of life and fun and colour and joy, to dissolve that destructive opposition between human expression (culture) and nature.

Surely all significant times of social change arise from a desire for a different future; people may act to change existing relationships of power and inequality but they will only do so if there is a widely articulated vision of how things might be other than they are. It's amazing what you can see in a cardboard ball-point pen. ●

Chris Ryan is professor of Design and Environmental Studies, RMIT and director, National Key Centre for Design at RMIT. In Australia the National Centre for Design at RMIT is working with manufacturers (such as the appliance company Kambrook) to 'eco-redesign' Australian products. With the support of the Federal Department of Arts, Sport, Environment and Territories, the Centre has established a database of eco-designed products from around the world to assist Australian research (see *21•C*, Summer 1992). The 1500 citations in that database clearly illustrate the rate and scale of new green production.

The Tao of Futures

RICK SLAUGHTER MEETS FOUR FUTURISTS WHO LOOK BEYOND THE STRICTURES – AND TIME LINES – OF A WESTERN VIEW OF THE FUTURE.

One rarely equates hard-edged economic theory with cherry blossoms and Buddhism. However Japanese futurist Kaoru Yamaguchi links the two – one of action, one of contemplation – to form a new theory of the economy. Yamaguchi points out that the Western notion of 'the future' is based on time being 'linear'. In Asia, individuals working in the futures field are drawing upon other notions of time – Islamic, Chinese, Karmic and Buddhist, and, in Japan, even 'Emperor time' – models of time which spring from a cyclical, spiral or periodical structure. These traditions generate futures perspectives more diverse than the Judeo-Christian viewpoint.

Violoeta Lopez-Gonzaga from the Philippines considers animist notions of nature, China's Quin Ling Zeng examines the tradition of visionaries back to Confucius. Sohail Inayatullah, a Pakistani living in Hawaii, looks for the deep cross-cultural patterns in history and how the Chinese, Indian, Islamic historian observes the future. While welcoming the stimulus that ideas from the West can generate, each of these futurists attempt to re-imagine Asia through indigenous eyes. They may also provide an example for the rest of the world.

"The American economy needs to be restructured," Yamaguchi says, with approaches which go beyond simple market-driven systems. The failure of Soviet socialism does not, he says, mean capitalism has succeeded. "After the corruption of the Soviet Union, many believe a market economy is the solution. If we consider that the American economy is losing against Japanese competition, we should say that the American market system is not so efficient either."

The crux of Yamaguchi's argument centres on the 20th century 'information age'. The industrial age produced three main economic theories: the neoclassical, the Keynesian and the Marxist which in turn created the three political institutions: conservative capitalism, welfare and socialism. Yamaguchi believes that if we are approaching the so-called information age or information society, the three economic theories are inadequate.

"In the information age we have more and more products related to information," he says. "A simple example is computer software which is different from goods and services. Software requires few material resources, but many intellectual ones. It can be used repeatedly, modified, up-dated and changed. It is more fluid, less material, than typical industrial products like cars or refrigerators. Unfortunately, if we want to maintain market-based economic systems like the American model, we have to make information-related products comparable to goods. That means we need intellectual property rights to handle information just like goods. My prediction is that as we produce more and more information-related goods we won't be able to handle those products within the market economic system.

"The Japanese economy is working better than the American economy not because of cultural differences but because the nature of the economic framework in Japan is more suitable for the information age. Unfortunately most American economists – those trained in the traditional neoclassical or market economic systems – don't have any other ideas."

"The Japanese economy is working better than the American economy not because of cultural differences but because the nature of the economic framework in Japan is more suitable for the information age"

Yamaguchi outlines a different economic system which he calls 'Mu Ra Topian': "I've been influenced by so-called holistic ideas. In part they suggest that Western civilisation, based on Christianity, is now challenged by Eastern philosophy based on Buddhism and more holistic approaches.

"'Mu Ra' literally means village, reflecting the image of the information age as a 'global village'. 'Mu' also happens to be 'nothingness', a basic idea of Zen Buddhism. 'Ra' means being naked, or without possessions, a stark contrast to the industrial age which was based upon predatory materialism. But that has to be replaced with a new concept of ownership which I just describe as 'possessions'. When we are born we have no possessions; and when we die we can't carry wealth with us. So the concept refers to human beings just as they are; we can just enjoy what we are doing without accumulating a lot of goods and without being controlled by those owning the assets."

According to Yamaguchi, this system works better than capitalism, which is controlled by the owners of corporations without the magic ingredient of staff involvement in management. Unlike the predominant Western view, he says, the year 2000 is insignificant to the Japanese. "In Japan when our Emperor dies we change the name of the era. About five years ago our Emperor died, and that became the last year of Shoaa. Then the new Emperor was seated and we had another name for the new era, which we called Heisei.

Everyone is influenced by the change to a new era. Rather than look to the year 2000, we consider the change to a new era under a new emperor much more important.

"From the Western point of view, which sees time flowing in a linear way, a century is a *big* change in history, but my feeling is that after the year 2000, some people will then lose interest in the idea of futures studies."

The notion of linear time gives way to a more cyclic view, says Yamaguchi: "It's the Buddhist notion of *karma*. We usually think when we die we will be reborn. In Japan we have the four seasons, so every April we have lovely new cherry blossom. Since we have new blossoms every year we believe that life repeats. If we go back to history, we don't have a linear history in terms of numbered years. So there is no way to compare which part of the year we are in when we study history. Recently we adopted Western calendars to make our history linear! In the past, we just referred to the year of the Emperor's rule.

"According to Zen Buddhism future and past are just within our brains. I did Zen meditation for many years and concentrated on the concept of time. In one sense, one could say that there is no future, because the future is part of the present. But we don't think that way. We just check the calendar and say time flows in one direction. So there's really a tension between the cyclical and the linear views.

"Some historians point out that history only exists for the present. We interpret history in the way we need it. In this view, history does not exist. We stand in the present, trying to make of it what we can. So that's why if we concentrate on a richer understanding of present situations, then answers for the future may emerge."

From Upheaval to Harmony

Amidst the turmoil of the China's 1975 Cultural Revolution, Qin Lin Zheng, discovered a new Western field of study called futures. From a distance, both physical and cultural, Zheng studied Fred Polak's *The Image of the Future* and *Prognostics*, attempting to understand this strange new field. Writing articles on futures studies in the Chinese media, Zheng became famous for introducing futures into China. An interest that fitted well with the Chinese bid for modernisation.

"The Chinese are genuinely interested in the future of the *society*," says Zheng. "Visions of future societies started with such philosophers as Confucius, so there's a long tradition. They discussed the future in terms of harmony and tradition. People realised that there are different visions of future societies available from the West in addition to our traditions, legends and stories. There are also visions based on science, technology and fiction."

Among Chinese intellectuals the idea of a 'post-industrial society' inspired fervid debate: "We understood that the development of the world is uneven. Some societies are developed, while others are developing. The differences between the two are technological and economic. Similarly, there are two political systems: socialist and capitalist. In China we've adopted a Marxist view of the future, moving from socialism toward communism.

"The post-industrial theories developed by Western thinkers like Daniel Bell covered economic and technological matters. One conclusion was that the 'post-industrial' society, or 'information society', is a new stage in social development. They combined the economic and technological, but skipped over the political dimension, arguing that no matter what system you had, the future would be post-industrial. But, in China, we were also concerned about the political system and social structures."

Those structures were called into question after the upheaval of Tiananmen Square. "Since then there has been considerable rethinking about how our society has functioned in the past and how it might function in the future," says Zheng. "There are attempts to use futures research to consider the future construction of the country – socially, economically, and even politically. It may even be that the upheaval has *encouraged* futures studies."

Zheng studies the future of China in relation to science, technology and social progress. "I've looked at what is termed 'the new scientific and technological revolution'; developments in microcomputers and modern communications relating these developments in technology to social development.

"I'd like to see our country becoming modernised in a short time, 10 or 20 years. I hope we can move toward a future which combines economic, social, environmental and political development. We're looking for harmony between each of these; an overall holistic view. Harmony is a particularly Chinese concept, it means everything goes well and peacefully. The word 'harmony' also suggests a synthesis of East and West. Society is always moving on, marching on toward a better future. So I am optimistic. To me the future *is* a better place."

From E-Mail to Islam

For a futurist involved in the judicial system, Sohail Inayatullah has some populist ambitions. He hopes to write episodes of *Star Trek* and produce a video that combines Islam with information technology.

Inspired by an Alvin Toffler film, Inayatullah's video would show the future as exciting without trivialising technology or religion. "A couple are walking," Inayatullah enthuses, "the whole scene is romantic, soft, environmental. It's about love and softness. Then suddenly you zoom in on their faces, and they are both robots! It's stunning. Bearing in mind that communication is central to Islam, it would be interesting to show *mullahs* (priests) using electronic mail or virtual reality to call out the *azan* (the call to prayer) and raise questions about the future of Islam and technology.

However, in his broader futures work, Inayatullah went from an internship in futures studies in the Hawaii court system researching the rights of robots, the prospect of Hawaiian secession, and whether prisons should be eliminated and biological drugs used instead. It was a project

which became emulated throughout the US and filtered throughout the Hawaiian judiciary. Word was spread by the publication of an innovative newsletter, *Justice Horizons*, publishing features on the future with strong legal-criminal-court dimensions. "We asked things like: What would happen if 50 per cent of the judges were robots? What would happen if all crime was eliminated? Questions which were meant to open up some new thinking."

Inayatullah is currently involved in several projects: one on macro history. "A group of colleagues and I looked at some 20 philosophers. We took Islamic, Indian, Chinese, Western, Gaia, feminist philosophers. We asked what are the deep patterns of history, the long-term cycles – 500 years, 1,000 years? Are they linear, cyclical or spiral? What are the types of time? Spiritual time, Asian time, Chinese time? How does the Chinese, Indian, Islamic macro-historian look at the future? We established a model of macro-history which is also a model of macro-change.

"One thing to understand about the Islamic dialogue is that Islam is trying hard to have a real conversation with Western civilisation. So why not start to have dialogues with Aboriginal and Chinese civilisations? There's no need to stay with a single, over-arching dialogue – this fixation with the West."

Currently, Inayatullah is involved with a futures course in Bangkok where Asian students analyse Asia at the centre, rather than the periphery. "It may become extremely important, partly because it will assist universities from Australia to Japan to Delhi to Islamabad to work together," he says.

"When I look at our research on the courts, five years ago, so many of the [Star Trek] shows come up as research topics, but from a fictional view. I'd like to take a traditional context, a traditional environment, and give it a sharp jolt, a shift into something unexpected, an alternative perspective that might shock people into a new awareness of things."

Visualising alternatives

The spiritual and animistic belief systems of the hill tribes of the Philippines may be ingrained in Filippino culture but they must be taught that there are options for the future of the impoverished Asian state, according to Filipino futurist and anthropologist Violetta Lopez-Gonzaga.

"The hill tribes of the Philippines are more resilient in the face of crisis," she believes. "They have maintained a degree of autonomy from the capitalist system that has engulfed the lowland Philippine communities and retained a basic respect for nature. Their cosmos is inhabited by spirits – the sacredness of trees, rivers and waterways.

"The key to the hill tribes' survival was maintaining traditional subsistence agriculture. The path of social change then was not assimilation *per se*, but *dependency resistance*. One foot of this community was in traditional subsistence agriculture, the other foot was in the cash crop economy.

"Much has been lost because of 300 years of colonisation. Yet these continuities should be preserved and somehow rediscovered in plotting out the future of Philippine society. If major cultures encroach upon weaker ones the path is not necessarily outright assimilation. While being incorporated into the cash economy, they also maintained their traditional mode of production."

The Philippines is a country in rapid transition. It's massive social, economic, political and environmental problems are being researched by the Institute for Social Research and Development where Gonzaga is executive director. The Institute studies agrarian reform, determining the pulse of the people and making projections.

'Since Tiananmen there has been considerable rethinking about how our society has functioned in the past and how it might function in the future... it may even be that the upheaval has *encouraged* futures studies'

Gonzaga is keen to add futures orientation to their research. "We want to visualise alternatives to agrarian reform in a country where population is growing rapidly and agricultural land is shrinking, taken over by industry. But how do you rework this concept into a model of social change? What is the best response to population explosion in a strict Roman Catholic society?

There will obviously be resistance in Philippine culture to long-term views which Lopez-Gonzaga describes as lacking knowledge and stuck in the 'here and now'. "There has been no vision that would propel the society to move ahead. Futures thinking hasn't seeped into the stream of consciousness," she says. "So it's important to popularise the idea. Somehow futures suggests something esoteric, out of this world. In that sense, Filipinos have a futures' view, but they rely on folk culture, the mediums, astrologers and seers. So we want to popularise the notion that there can be another way of developing future vision."

There could be much to gain by looking beyond the 'First World' linear view into the Asian-Pacific tradition, says Lopez-Gonzaga. "With a cyclical view, the sense of time would be different. In anthropology, there's one theory that promotes a view of a 'pan-Austronesian' world, which includes Oceania and the Philippines, Malaysia, Indonesia. So maybe one day we will see a 'pan-Austronesian' futures view."

These futurist interpretations overlap and reinforce each other, providing a valuable clue to the universal nature of futures work. Futures develops not for the benefit of individuals, groups or even nations. In the closing years of the 20th century, it has become a necessity, generated by the conditions of the time; the need to complete the transition from old-style industrialism to a global civilisation founded on quite different principles. ●

Rick Slaughter's last article for *21•C* was on Jim Dator.

continued from page 13

engineers, physicists and Ph.D. students testing a variety of one metre long orbital motors mounted inside the tunnel. Advanced laser 'diagnostics' and recording instruments are stationed outside windows to record the combustion processes and the complex internal and external airflows.

One experiment running in T4 – a composite structure engine – is part of a three year Collaborative Research Grant, with partner's WBM-Stalker Pty Ltd who have substantial engineering skills and the Australian Defence Industries Ltd (ADI) who bring in expertise in fabricating high-strength, high-temperature motor chambers. The goal is to manufacture during 1993 a cheap, composite, prototype engine, which could then be integrated into a multi-module "free-flying" vehicle. The scramjet is unique in that it can be modular and therefore stackable like Lego, or able to be clustered around a circular airframe.

Central to the project is developing Ray Stalker's idea of flying an "expendable" engine to avoid the "unobtanium" criticisms of rocket, structural and materials engineers overseas that materials and techniques will not be found for a practical, re-usable engine. The temperatures to be encountered in the scramjet combustor range from 1000°C (1832°F) to 1380°C (2500°F), and 1760°C (3200°F) at the leading edges of the engine intake. The expendable approach avoids these rigours of hypersonic flight, although the Australian materials challenge will still be significant. According to Stalker this is the most sensible, quickest, and affordable Australian way to a small launch vehicle and orbit, as well as an important proving step on the road to reusable engines of the larger spaceplanes.

Malcolm Jenkins of the WBM engineering firm says that "there will be a lot of toing and froing about what is desirable from our aerodynamics point of view and what is possible from a manufacturing point of view at ADI, but the kernel of it is that this becomes something absolutely do-able in Australia – the testing, the development, the manufacture – it is all within the capabilities of Australian Industry."

What are the benefits for ADI? Ken Harris, managing director of ADI says they are "assisting a technology where Australia has some degree of leadership at the moment in eventually selling the scramjet motors, and at the very least in materials spinoffs, consultancy advice, and supply of components". He adds that it is not a "short-term return, but a strategic investment for the evolution of Australian technology."

Ernie Mackley from NASA's Hypersonics Propulsion Branch says that the 'expendable' composite engine "is a good way to go".

CANBERRA, WE'VE GOT A PROBLEM

In the last 12 months there has been considerable excitement in the Australian camp, with engine work progressing to the stage that flight tests are being considered. "Within the next five years we will be testing one of these scramjets in the atmosphere at Woomera – given funding. We're that

Stalker tunnels world-wide

In 1987 the Americans contracted WBM-Stalker to design and oversee construction of three tunnels. A large 'T5' is now operating in Los Angeles at the Californian Institute of Technology performing scramjet combustor tests, and Rocketdyne of Rockwell International (the shuttle builder), has nearly completed the fabrication of a massive 120 metre long, national scramjet facility at Santa Susana just outside Los Angeles. This National tunnel called 'RHYFL' will test full sized scramjets for their National Aerospaceplane – the successor to the inefficient shuttle. This wind tunnel with its two metre test section, is a 'T20' in size.

Stalker tubes have been commissioned by Germany and France, while the Japanese are currently requesting funds to build a large tube in 1994 at their National Aerospace Laboratories near Tokyo to catch up in the scramjet powered spaceplane field.

Instrumentation: the key to combustion

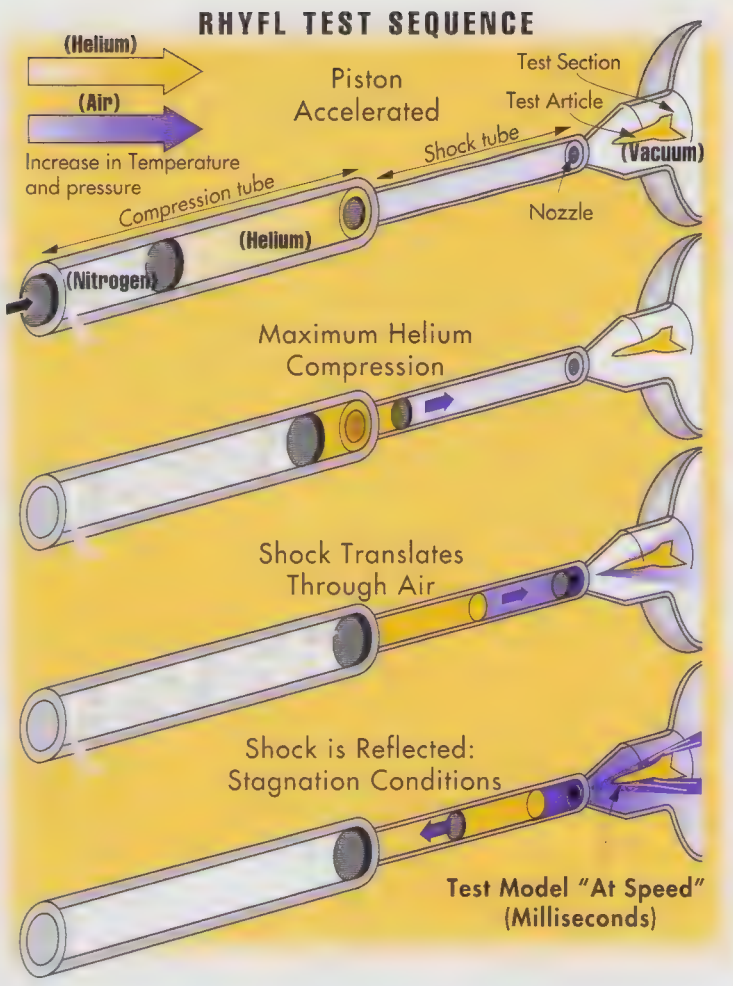
Stalker's first large wind tunnel , T3, was built at the Australian National University, Canberra in 1969, in a building at the foot of Black Mountain. The pioneering tunnel is now under the direction of Professor John Sandemann and Dr Frank Hauwing, world leaders in laser diagnostic instrumentation. Lasers are the only accurate way to measure the performance efficiency of scramjets. In one technique developed by the Canberra group, called CARS (Coherent Antistokes Raman Scattering), laser beams criss-cross the water vapour exhaust tail of a scramjet. The hotter the water vapour, the less efficiently the scramjet is operating, because heat of combustion is escaping unused. The lasers also provide information on temperature, turbulent boundary layers (chaotic airflows), shock waves, air pressure and density. Scientists at the nearby Australian Defence Force Academy are also using lasers to measure in T3, the aerothermodynamic effects of space vehicles re-entering the Earth's atmosphere. ○

close," says Dr Allan Paull, one of the scientists from the University of Queensland working in hypersonics.

Stalker wants to construct a flight test centre at the Woomera Range, and in 1991 asked for $15 million to build a national facility under the programmes administered by the Australian Science and Technology Council. However, although short-listed, it was recommended for priority review in five years' time. The engineers think this may be too late in the flight test race.

Australian flight tests would certainly consolidate Australia's lead, but equally important they would be a valuable step along the road to convincing government of the feasibility of the end product – the space launching craft.

Scramjets are currently being developed in America, France, and Japan as powerplants for aero-spaceplanes. Australia, however, does not have the resources to compete with such programmes. But Stalker's innovative hybrid compromise of a half scramjet and half rocket is unique. He has proposed a 'second-stage' scramjet booster for the three-stage Southern Launch Vehicle (SLV) proposal which is on the drawing boards of Hawker de Havilland and British Aerospace Australia. The SLV is aimed at putting one tonne satellites into low Earth orbit when Woomera is upgraded. Ted Stapinski, managing director of Auspace Ltd in Canberra and an SLV partner, says "the first SLV launches would be done with overseas rockets to give our customers' confidence, but two to three years downstream when Stalker's rocket becomes available we will replace the overseas SLV rocket to make a more cost-effective launcher".

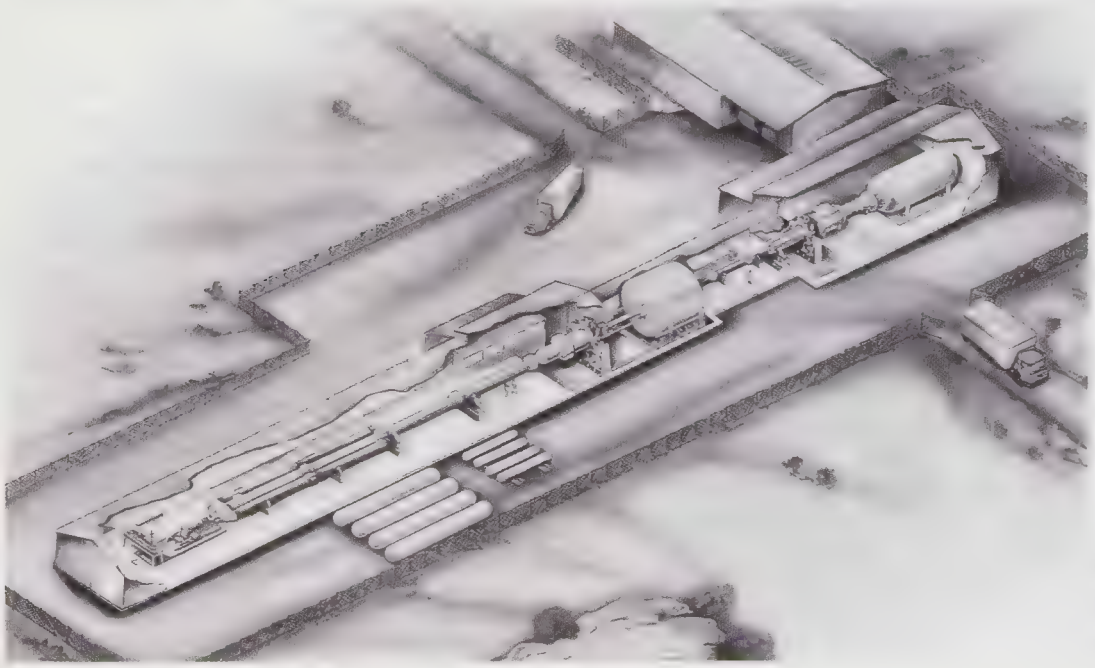


NORMAN ROBINSON

ADI's solutions to the "composite-engine" materials challenge might be an important step along the road to realising the 'second-stage' scramjet booster. Certainly the industrial plan is to involve more Australian content in the rocket launch proposal, something that government will seriously have to consider.

Dr Russ Morrison, director of WBM Stalker Pty Ltd, says the second stage booster will allow them to take on the world-wide competition. "We can do experimental contract work for the NASP programme, we can do low-cost scramjet work, even design and develop scramjet rocket stages to improve costs per launch and 'throwaway' expendable scramjets. It can all be done in Australia and sold to the world."

Unfortunately, Stalker's group have failed to receive adequate funding to maintain staff levels, let alone expansion into new engine and 'super-orbital' tunnels, flight tests, and scramjet-rocket proposals. They have been knocked back by all government sources, so far, including Paul Keating's $872 million Co-operative Research Centres programme, because government is unable to determine whether the work is science or technology, and therefore, its commercial value and viability. The Australian Space Office has refused three funding submissions to expand the scramjet project, because it believes the enterprise is too big and costly for Australia.


ARTIST'S RENDERING OF THE ROCKETDYNE HYPERSONIC FLOW LABORATORY (RHYFL)

Professor John Simmons says that "we don't expect to get big handouts from government, but the issue is we have to look further ahead to capitalise on our comparative advantages, and developing this technology before it is purchased off the shelf in other places – which will be pretty soon. We must avoid

How the scramjet was 'launched'

Scramjets in their winged spaceplane application had their birth at the same time as 'manned' rocket technology in the late 1950s but the urgency of NASA's "man in space soonest" ballistic capsule programme and the Pentagon's ICBM project pushed aside economics for urgency, leaving an entrenched rocket industry in its wake.

Both NASA and British agencies had scramjet 'aerospaceplane' projects on the drawing board in 1960 and 1961, but by the end of the decade they were gathering dust after Saturn-5s, as tall as skyscrapers, began lifting off to the moon. Scramjet spaceplanes paled in significance. Now it is back to the future with scramjets. Or as US scramjet engineer, Ed Kush says, "scramjets come and go in cycles, and perhaps we haven't seen the last".

The two major figures who promoted the engine in the late 1950s and proposed its application in spaceplane and hypersonic transports were Dr Antonio Ferri, an Italian aerodynamicist, working at the General Applied Sciences Laboratories Inc. (GASL) at Westbury, New York (during 1958-1967), and Dr Ralph R. Jamison, at Bristol Aero Engines Ltd (during 1957-63). Ferri was universally revered as one of the fathers of supersonic flight and an author of a classic text, *Supersonic Aerodynamics*. He became known as the "father of the scramjet" for his ability to demonstrate in 1959 that stable supersonic combustion was possible in a "fixed geometry" scramjet "if correct temperatures and pressure were maintained".

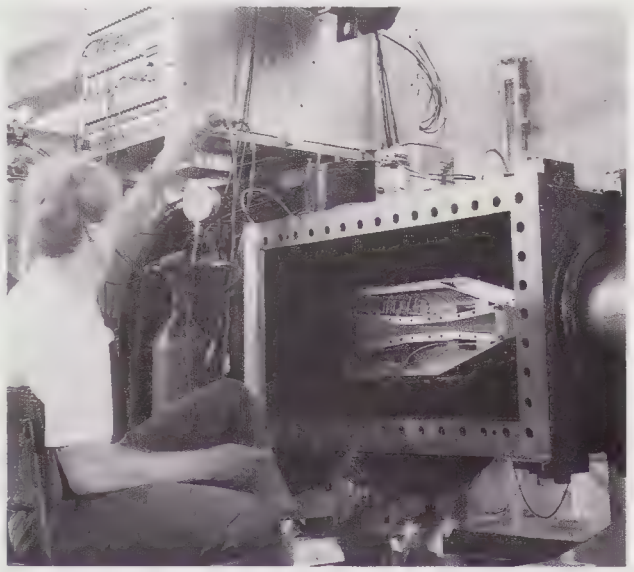
Later, at a closed NATO conference in Milan in April 1960, Ferri outlined its use for a reusable, orbital spaceplane with integrated 'engine/airframe'. But neither the aerospaceplane project (designed for scramjet flight up to Mach 10) nor the rocket propulsion for final orbital insertion were to become development programmes in the age of rocket fever of ICBMs and Moon missions. Four years later, in a famous lecture given at Britain's Royal Aeronautical Society, Ferri broke secrecy by discussing the difficulties and rewards of building engines, inspiring many scientists, including Australia's Ray Stalker.

By the time the decision was made to build rocket boosted shuttles in 1969, scramjet research in the US was virtually at a standstill. Ferri died in 1975 failing to see his innovative concept reach fruition, but scientists at NASA Langley kept a silent programme running through the 1970s awaiting the day when administrators would see the value of the pathway. This finally occurred in 1983 with feasibility studies at DARPA, resulting in President Reagan's aerospaceplane announcement of 1986 as a replacement for the shuttle. ○

this at all costs."

Two government reports have recommended support for Australia's scramjets: the Senate Standing Committee on Transport, Communications and Infrastructure's, *Developing Satellite Launching Facilities in Australia and the Role of Government* (April 1992); and a report by an expert panel reviewing the Australia Space Office and its activities, titled *An Integrated National Space Programme* (June 1992).

Jack Curtis, chairman of the expert panel, says: "the scramjet might well be part of the future. If Stalker could advance it to the patent stage then we could negotiate with some major companies offshore." The Queenslanders, however, believe



Testing the WBM/ADI scramjet in the T4 composite structure engine.

that it is premature to give away Australia's ideas and technology, when they are so close to proving the concept.

The Australian Space Council has now been formed by government to oversee the Australian Space Office, and the scramjet is one of the proposals in Australia's Integrated National Space Plan. The Council, composed of representatives from all government departments, will provide a broader vision to what Australia can do. It may develop this unique rocket idea, or just recognise the wealth of technological opportunities that could arise from domestic scramjet development and collaboration. Or neither. Whatever the future, Australia has the wide open spaces to test scramjets at Woomera. Professor Stalker's spacely obsession is infectious and proving that not all Australian made labels are on packs of pasta or winged keels. He might well have launched a vehicle of enthusiasm that will propel his young Australian scientists and engineers into important new futures and adventures of innovation. But it needs more than that – it needs political will and funds. ●

continued from page 16

all the rest of it. But when dinner was served the chimp used to climb a pole and observe what was on the table. If it wasn't offered what it particularly wanted it would throw a temper tantrum.

Obviously the child's mind and behaviour is tempered through social expectations and also through the reflection process. So one assumes that over a period of evolution there is to some extent the mental capacity in animals to become more self aware.

There is an increasing complexity of brain function from the most elemental up to the homo-sapiens. Experiments with mirrors are extraordinarily valuable in giving insights into thought processes. I'll mention the chimps first – what happens is that when a creature sees itself in the mirror (this is also true of gibbons) they behave as though it were another member of their own species. They immediately adopt aggressive posture, bob up and down, threatening things and so on. But with a chimpanzee, over about three days exposure, the incidence of that decreases rapidly, until you reach a point where the animal starts to look at itself, it starts to examine its own body with the aid of the mirror, look inside its mouth, under its arms – otherwise inaccessible parts of its body with the aid of the mirror. Further experimental ratification of this is to anaesthetise chimpanzees and plant a red mark over the eyebrow or on the ear which they couldn't see without the aid of a mirror. When the chimp sees itself in the mirror and looks at the area it touches the mirror with a finger and smells the finger. Obviously you cannot scrutinise an otherwise inaccessible area of your body with the aid of a mirror unless you know who you are. Now chimpanzees, gorillas and orang-utans can do that, but apparently monkeys, with hundreds of hours of exposure, have not been able to. So it suggests that there is a quantum jump in cerebral evolution, because what it really amounts to is self awareness. There is another vast quantum jump to the scrutiny of one's own thought processes as shown in the human, but there is no question that the chimp's self awareness constitutes a major step foreword in evolution.

So awareness of self is a milestone in the development of the mind.

The chimpanzee has demonstrated that it knows it exists. In other words you can have two types of awareness. Awareness of what is going on in the external world, and that sort of awareness probably goes some way down the evolutionary scale. But to be aware of yourself is a quite different thing. It is making, at a human level, the mind transparent to itself.

Descartes said, "I think, therefore I am". And Bertrand Russell pointed out that that's not really good enough, because it has a concealed notion of self consciousness in it. But it is clear that as far as we can tell, certain chimps, orang-utans and gorillas have this capacity for self awareness. Of course the mirror test is only one criterion. In the book I've given an account of "despair in wild animals", and raised whether this involves self awareness. I've described experiments which one of the great psycho-biologists of the US, Curt Richter, did which were essentially swimming experiments. He put *domestic* rats into a swimming tank with the temperature of the water at about body temperature and they will swim for 24 hours. But when he caught wild, savage rats from the slums of Baltimore and put them in the tank, the rats swam up and down for a two or three minutes and then died. However, if after say, two to three minutes in the tank, he pulled them out, they then became rapidly aggressive again. But if in a couple of days time he put them back in they swam for 24 hours in the same way as the domestic rats. This was set against Walter Cannon's ideas of voodoo, why people die with voodoo, and the old stories of the Australian Aborigines, with bone pointing – somebody would just pine away and die. What actually happened? Well, Cannon had the idea that it was sympathetic over-activity. In other words, enormous discharges of the sympathetic nervous system, through fear and apprehension. What Richter showed by putting electrocardiograms on the wild rats was that they died as a result of the slowing of the heart, generated by some sort of cerebral process. The issue arises whether these wild rats had a perception that their circumstance was hopeless, and gave up and died. But, if rescued once, they appreciated that their situation wasn't necessarily hopeless, and then they swam on. Now how do you interpret that? Could the rat do that without being in some way aware? It is not an automaton, it must have a perception of its situation. So one must have an open mind as to how complex the cerebral processes of lower animals are.

The issue arises whether these wild rats had a perception that their circumstance was hopeless, and gave up and died.

Just last year there was the remarkable account of octopuses from the zoological scientific station at Naples. They had two groups; the first we will call the 'demonstrator' octopuses which learnt that there was a red ball and a white ball. If they swam along and grabbed the red ball, they got food. If they grabbed the white ball they got an electric shock. After a few experiences of this they got it right. When they were very good at it, other octopuses called observer octopuses, were put into an adjacent tank. Those observer octopuses had full vision of the 'demonstrator' octopuses grabbing the red balls and avoiding the white, even though during this part of the experiment the 'demonstrator' octopuses got no reward. The 'observer' octopuses then, when given the opportunity in the test tank, did it without a reward in terms of food, or experiencing an electric shock – it became clear that they had been paying attention to what was going on. But they had no contact with the other cage, they could just *see*. So in some way the 'observer' octopuses had appreciated what had happened. So that suggests that they had some cog-

nition in what is, after all, a very primitive invertebrate brain.

Therefore is there an expectation that the animal brain is evolving towards the human mind and the possibility of even higher levels of mind behaviour?

We certainly recognise that there has been stages in the evolution of the human brain. The first one would be in the *homonoids*, with the appearance self awareness, which is not there for monkeys. Then you have the development of tools two or three million years ago. Tools involved making an object, for an imagined eventuality – an enormous jump. Concurrently you had the emergence of language – the crucial step in communication which may have begun between a million and 1.5 million years ago. It is perhaps of great importance also, that corresponding to this time, charred bones have been found in the caves of southern Africa. Humankind's discovery of fire promoted social gathering which facilitated elaboration of language and development. Fire has the enormous advantage from a nutritional point of view of being able to render vegetable materials which are inedible, indigestable or poisonous, fit for consumption. And in terms of scavenged meat, if you heat it in the fire you destroy bacteria, so the likelihood of everybody getting sick from gastroenteritis was reduced. Stages can be observed leading up to the time of Neanderthal man and the ritual burial of the dead. This emerges about 70-80 thousand years ago. Ritual burials with flowers which bespeak a sense of the consciousness of human existence, and of the sadness of breaking bonds and all those elements of social and family organisation and maybe concurrently the beginning of mythology. Then 30 thousand years ago the development of artistic expression was clear. So one can see a progressive elaboration over hundreds of thousands of years.

Has there been any detectable development in the human brain capacity in the last two thousand years?

In this short time it would be difficult to detect changes in the brain structure or capacities. What has occurred is the concurrent cultural evolution vastly elaborating what the individual brain is able to do. Sir Peter Medawar says that the cultural – non-genetic transfer of information – has become more important than DNA. Things have altered dramatically in the repertoire of experiences that are open to people.

But there is no evidence of any physical or physiological developments in the modern times?

One could conceive of changes occurring. In a Darwinian sense, it is like driving along the highway noticing birds flapping into the paths of motor cars – one might wonder whether there is a strong selection pressure operating on magpies and other birds. Those that are able to detect and comprehend the significance of the noise in the distance of an approaching motor car are going to hand on their genes and have nice eggs, and so on, compared with those that can't and are dead on the roadside. That sort of pressure could be operating in modern society in relation to avoidance of violent death by the young.

Why the The Pinnacle of Life *in relation to where you have come and are developing in your professional life?*

There is no mystical implication in *The Pinnacle of Life*, I am just simply saying that human consciousness is the zenith of the biological process of evolution. It is the most spectacular aspect of the life process. It can be experimentally manipulated in man and animals. A chemical change can be produced quite rapidly in a particular locality in the brain in animals and it can dramatically alter the focus of attention, the demeanour, and indeed the endeavour to satisfy a goal or a need by the animal. Against the background of all I am dealing with in the book – and you could do the same thing in humans – indicates that you are manipulating stream of consciousness, the animal's awareness and its attention. How that comes about is a direct scientific question. Other scientists are concerned with it in different ways, as with sensory perception and vision. I've been preoccupied with body chemical changes and desires as a direct hands on experimental scientist for 30 years. But the book has been festering for a long time. It involves elaboration of issues I dealt with in *The Hunger For Salt*, but that is in a more technical, scientific book. I was asking many of the same questions there, and suggesting what challenging issues there were for the future. But now, I've had more time and in particular I've initiated new experimental programs on primates. In other words I've gone up the evolutionary tree to work on the primates. And I'm working at the South West Foundation in Texas on baboons and with chimpanzees and gorillas in Africa. As director of an institution the size of Howard Florey I simply would not have been able to find the time – to the extent I would have wanted – to go to these areas of Africa. Being no longer the director has sort of cut me loose and allowed me to do it.

Clearly there are people who are going to be of a religious mind, who will question your arguments. But how much does it challenge the prevailing thinking, and prevailing work in the area of mind or soul separate from brain?

I don't think that is the question. The prime purpose of the book was to display the challenge, some of the fantastic curiosities and focus on unanswered questions. I'm not giving an answer to what consciousness *is*, and nor is anybody else to my knowledge to this stage. I've cited some of the hypotheses, I've drawn attention to what could be powerful evolutionary forces that could provide selection advantage for the development of awareness. I've raised the question the need to match sensory inflow from different modalities, that is what is coming from touch, from sight, from the ear, and so on. How you have got to meld those things to make a gestalt, or coherent picture of the external world.

One of the things which is interesting is the extent to which neuroscience and science in general is focusing on this now. There was a time in the behavioural sciences when it was almost immoral to raise the question of what was going on in the brain in terms of awareness. Things have changed, people are really focusing on what in the devil is going on in the black box! ●

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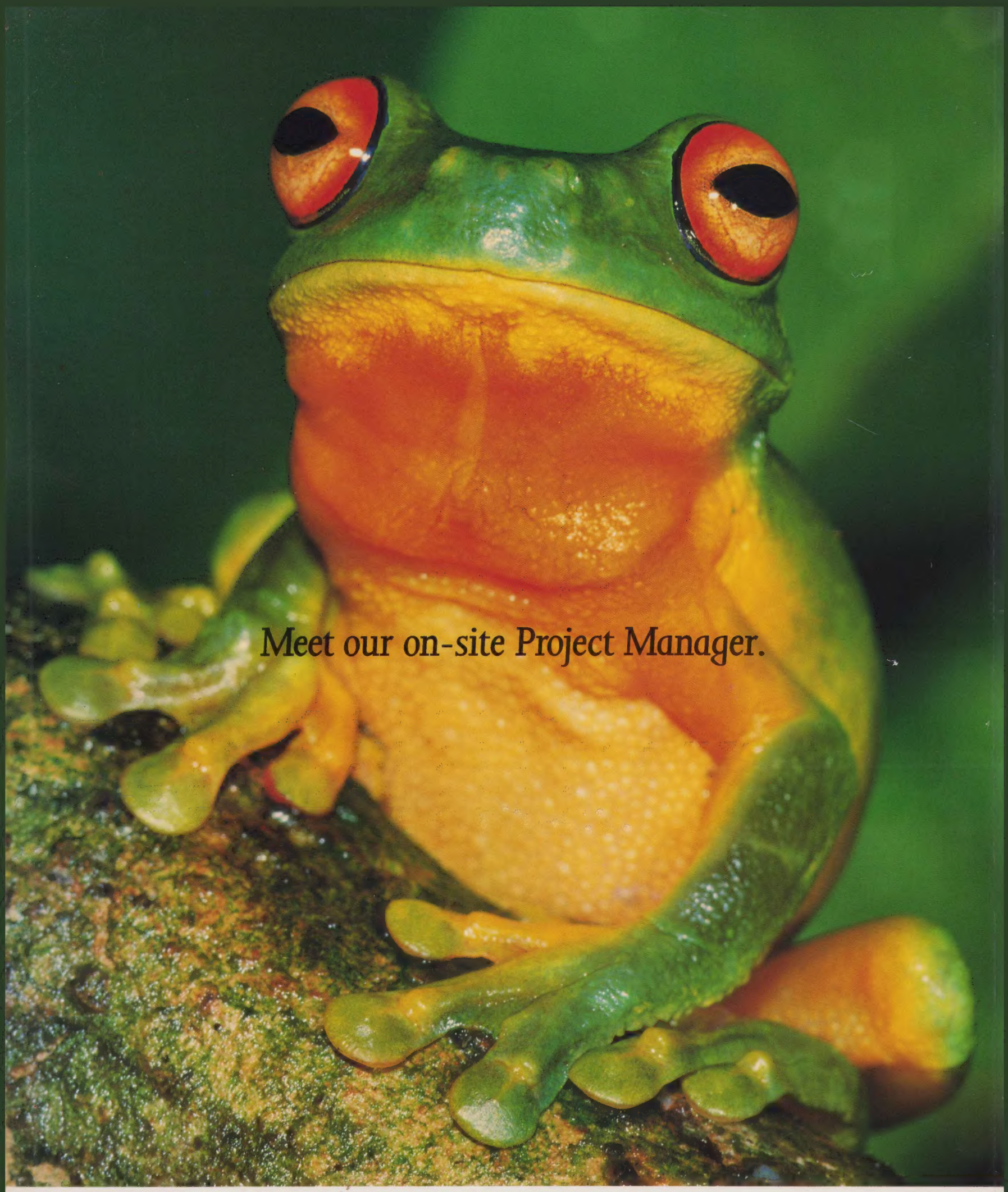

Telecom spent three months in a tropical rainforest completing an optical fibre link, but in the eyes of the locals things haven't changed a bit.

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